THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. MAY 20, 1897. CHICAGO, ILL. NUMBER 20.

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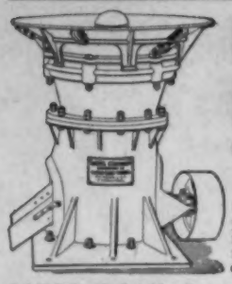

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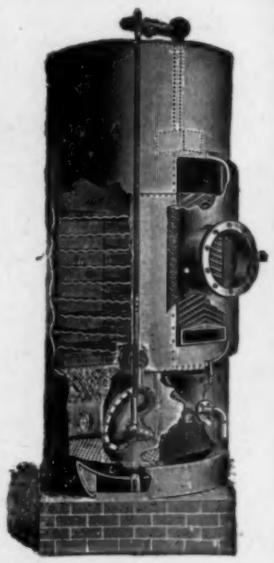

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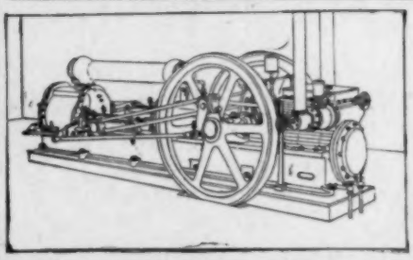

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THE IRON TRADE REVIEW

VOLUME XXX. CLEVELAND, O. MAY 20, 1897. CHICAGO, ILL. NUMBER 20

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The expected has happened to the beam pool and since the Philadelphia meeting of last Thursday there has been an open market. No large business has been done at new figures, since buyers want to see a further settling before committing themselves. It appears that 1.25c Pittsburg is being maintained thus far on Central Western business, while 1.15c Pittsburg is quoted on Eastern orders, and on one Eastern contract this week 1.10c Pittsburg was bid. Expectations of an immediate stimulus to building may not be realized, for buyers have had the benefit of cuts from the 1.55c Pittsburg basis for some time, in the nominal figures made on angles. The latter are now quite generally quoted at 1c Pittsburg. As if to keep up the supply of pools, the effort made one year ago to bring the wire rod mills of the country into an association is being revived. The aim is to cut down production to 50 per cent of present capacity, which is far beyond any present or prospective needs of the country. Last year's programme was interrupted by an Eastern concern, when all others were agreed. The same obstacle may be encountered again. The tonnage basis is now being worked upon. There is no serious attempt, apparently, to revive the wire nail pool, but if the rod mills agree to restrict output the way may be paved for similar steps by producers of wire as well as wire nails. Even if no pools are formed in the latter products, a curtailment of wire rod production would naturally tend to stiffen prices of both. In general the finished material market has not improved in the past week, and the number of products now on the basis of 1c a pound or less gives little encouragement. A 5,000-ton lot of grooved steel skelp at .82½c, Pittsburg mill, is an index of the competition that exists on narrow plates. Yet for open-hearth plates some Pittsburg mills are getting 1.05c, and 1c is the minimum of others. The meeting of the Amalgamated Association in Detroit this week and that of the tin plate manufacturers appointed for Friday in Cleveland, give advance notes of a wage contest that may be a large factor in the midsummer market. The talk of $5 puddling by workmen may not avail this time to secure the continuance of a $4.50 rate, or 50 cents more than many mills are now paying. The tin plate manufacturers will have to meet a demand for higher wages, the while they are strongly opposed at Washington in their efforts to put the home trade in a position where good wages can be paid. Developments in pig iron in the past week give more ground than has existed at any time in the year for the belief that prices are at bottom. Some considerable purchases by agricultural and other buyers in the Chicago district are noted, and the probability that production in the South will be reduced, together with a further curtailment in the North promises to bring consumption and output close together by the middle of the year. For the half year a cosumption of close to 4,000,000 tons is indicated, or considerably more than would appear from the general complaint. Bessemer iron has sold at $9.25 Pittsburg, prompt delivery, but $9.50 is the furnace quotation, and with the exception of one or two lots it would appear that iron at valley furnace is being held close to that figure. Billets at $16 Philadelphia, $14 Pittsburg and $13.50 Shenango and Mahoning valleys, are in little demand.

THE CLEVELAND DISTRICT.

Sales of iron ore to date are more than might be inferred from the general disposition to think of the ore business as in a state of suspended animation, or from the wretched condition of lake interests. Apart from the 1,200,000 tons of Mesabi ores the Carnegie Steel Co. will mine, its purchases of 400,000 tons of Vermilion and Gogebic ores are to be added to a probable 100,000 tons of Pewabic. The Illinois Steel Co.'s engagements include 600,000 tons of Mesabi, nearly all of which is Fayal, and enough Chapin, Cleveland, Lake Superior and other Menominee and Marquette range ores to bring the total close to 1,500,000 tons, with what is yet to be shipped on last year's contracts. An Ohio furnace ocmpany has taken 100,000 tons of ore the past week —50,000 tons of Mesabi and 50,000 tons of Marquette Bessemer. Other sales bring the total up to between 3¾ and 4 million tons, including the Carnegie Mesabi ores. Add to this ores that will be taken by furnace and steel companies having mines or mining connections, and there is the best authority for saying that 5,000,000 tons of ore are already placed for 1897—what would have been considered, not so many years ago, a fair year's business. There has been some chartering from the head of the lakes the past week, 150,000 tons of ore having been placed at 70 cents to Nov. 1, while 60 cents has been done to Sept. 1.

Pig Iron. The gradual disappearance of weak iron from the market, and the fact that such producers as have made the low prices heretofore are not in position to market much metal, are cited as indicating that furnacemen's prices will be more of a factor in the Bessemer pig iron market in the next few months. Quotations are $9.50 in the valley for prompt shipment, while $9.75 is asked for deliveries in the second half of the year. There are indications that little more speculative iron is to be had. Foundry grades are slightly weaker, and there is considerable difference between quotations maintained by some sellers and the figures named in connection with actual sales. While $9.25, and in some cases as low as $9 has been done on No. 2, other sellers are holding at $9.50 and $9.75. Some pipe iron has been sold for Cleveland consumption recently, and a delivered price of less than $8.75 on gray forge is reported. We quote, f.o.b. Cleveland:

Bessemer	$9 75@ 9 90	Valley Scotch No 1	$10 75
No. 1 Strong Foundry	10 50@10 75	Valley Scotch No. 2	10 25
No. 2 Strong Foundry	9 90@10 25	Gray Forge	8 75@ 8 90
No. 3 Foundry	9 50@ 9 75	Lake Superior Charcoal	13 25

Finished Material. The contract for the Chamber of Commerce building, with its 1,000 tons of steel, is still unplaced, and several questions are being contested in committee. The new basis on beams and channels is 1.25c, Pittsburg, or 1.33½c Cleveland, but so far no business has come up to test the reputed arrangement among the four mills ordinarily competing for Central district business. The bar iron market languishes and the recent quotations below 1c at valley mill have not stimulated demand. There is some expectation of shut-downs on account of scale differences and the extremely low quotations of recent weeks on sheets are not made on business after July 1. We quote No. 27 common black at 1.90c to 1.95c, Cleveland. Skelp mills have made their lowest prices in the past week, and the market for plates has not been helped by these quotations, though some plate mills are still maintaining a basis of 1c to 1.05c, Pittsburg. Wire and wire nails are quoted at $1.10 and $1.35 respectively, Cleveland mill, with rods at $20.

CHICAGO.

OFFICE OF *The Iron Trade Review*,
1142 MONADNOCK BLOCK, May 19.

Buying in raw material was quite a little heavier last week than the week before as several of the agricultural implement manufacturers placed orders for large lots of pig iron. Sales in most other branches of the market show a slight improvement and generally the situation is better than it was a week ago. Dealers are more confident of the future and express the belief that business will continue to improve from now on. The last of the pools was dissolved last week, the beam pool having been formally abrogated the last of the week. Prices on beams, as a consequence, have dropped from 1.70c to 1.40c for Chicago delivery. This has been the only change in quotations throughout the entire list during the week. The break of the pool has not as yet caused any rush in orders for beams, as buyers have apparently decided that prices are still too high as compared with quotations on other products, and that they will make no purchases until the market has a chance to settle. At the same time there is very little building in prospect in this city at present, although in several of the Western towns the situation is much better than it is here.

PIG IRON.—Several sales of both Northern and Southern iron were made last week to agricultural implement manufacturers; the total is probably in excess of 15,000 tons. This was about equally divided between the North and South. As these concerns are the largest users of pig iron in this territory and have usually been in the habit of buying their iron when the market is about at bottom, the placing of their orders ordinarily signifies that the market is fully as low as it will be and consequently these sales are followed by sales to a number of smaller buyers who have not the incentive to keep as fully posted on the market as the largest consumers and rely upon the judgment of the latter to a large extent. It is expected, consequently, that buying for the next few weeks will be heavier than it has been of late and that the market, if anything, will be firmer than for the past few weeks; in fact, there are evidences that some of the furnaces are desirous of increasing their prices and it is undoubtedly true that some of them at least have refused to meet the low quotations which have been made in the last week or two. On the general run of business the prices we give represent very fairly the condition of the market at present:

Lake Sup. Charcoal	$13 00@13 25	Southern No. 1 Soft	$ 9 75@10 25
Local Coke Fdy. No. 1	10 50@10 75	Southern No. 2 Soft	9 50@ 9 75
Local Coke Fdy. No. 2	10 25@10 50	South'n Silveries	10 25@10 50
Local Coke Fdy. No. 3	10 00@10 25	Jackson Co. Silveries	13 00@15 00
Local Scotch Fdy. No. 1	10 50@10 75	Ohio Silveries	13 00@15 00
Local Scotch Fdy. No. 2	10 25@10 50	Ohio Strong Softeners	12 00@12 25
Local Scotch Fdy. No. 3	10 00@10 25	Alabama Car Wheel	15 50@16 00
South'n Coke No. 1	10 25@10 50	Malleable Bessemer	11 50@12 00
South'n Coke No. 2	9 75@10 00	Coke Bessemer	11 50@12 00
South'n Coke No. 3	9 50@ 9 75		

BARS.—The mills report some slight improvement in both inquiries and sales and that the outlook for the future is very much more hopeful than it has been for some time. Some contracts have been placed in the last week, most of them for comparatively small lots, but one or two have been of fairly good size. Prices are still very weak and have been made at lower figures than those we give. The open market quotation is made at 1c to 1.10c for both common iron and steel bars from strictly billet stock.

RAILS AND TRACK SUPPLIES.—The demand for light rails was quite a little larger last week than the week before and sales have increased to a proportionate extent. Heavy sections are not in large demand. Quotations are made: Rails, $21 to $23, according to specifications; steel splice bars, 1.20c to 1.30c; track bolts with square nuts, 1.90c to 2c; hexagon nuts, 2c to 2.10c; spikes, 1.60c to 1.65c.

BILLETS AND RODS.—No very large business in billets or rods was closed last week and none is in sight for the immediate future. Quotations are unchanged at $16.50 for billets.

STRUCTURAL MATERIAL.—Prices on beams have been reduced to 1.40c, Chicago, as a consequence of the break of the beam pool the latter part of last week. It was expected that upon the dissolution of this pool a large number of orders would be had for structural material but up to the present time this has not been the case. On the contrary the demand has been affected, in this market at least, to a very slight extent. There are no large buildings projected in Chicago at the present time and it will take considerable inducement to make property owners believe that it would be wise to construct buildings under the existing state of affairs. Structural contractors incline to the opinion that prices of beams are still too high to make the building business good, and that they must be reduced materially from the present level before any large contracts can be secured. The only contract of importance placed in this territory last week was that for the Fort Wayne courthouse, which was figured upon several weeks ago but was never closed. This will take about 1,400 tons of material, which will be rolled in Pittsburg. Quotations are as follows: Beams and channels, 1.40c; angles, 1.15c to 1.20c; plates, 1.15c to 1.20c; tees, 1.40c to 1.45c. Small lots from stock are quoted one-quarter to one-half cent higher.

PLATES.—The market showed a little improvement last week and while no large contracts were placed the total tonnage of small orders was quite a little in excess of the week previous. Prices are still weak but have not been changed. They are made as follows: Tank steel, 1.15c to 1.20c; flange steel, 1.25c to 1.35c; fire-box steel, 2c to 5c.

SHEETS.—Black sheets are in fairly good demand and sales last week were probably slightly in excess of those of the week before, and included several good contracts. Prices are inclined to be weak and figures quite a little under those we give are heard. Galvanized sheets are increasing in demand although sales last week were not especially large. Quotations are made at 2c to 2.10c for No. 27 black and 80 and 5 to 80 and 10 per cent discount on galvanized.

MERCHANT STEEL.—Dealers report a better business last week than was had the week before and a better outlook for the future. Most of the business closed was in small lots but one or two of fairly good size were closed. Prices are as follows: Open-hearth spring, tire and machinery steel, 1.60c to 1.70c; smooth finished machinery steel, 1.50c to 1.55c; smooth finished tire, 1.35c to 1.40c; tool steel, 5.50c to 7.50c; specials, 11c and upwards.

OLD MATERIAL.—The market last week was quiet and no large sales of any class of material were made. Prices are made at $11.25 and $12.25 for old iron rails, $6.50 to $7 for old steel rails, and $10.25 to $10.75 for old wheels. Miscellaneous scrap is quoted about as follows: Railroad forge, $10.50 to $11; dealer's forge, $8.25 to $8.50; No. 1 mill, $5.75 to $6; heavy cast, net ton, $7.50 to $7.75; malleable cast, net ton, $8.50; axles, $14.25; cast borings, $3; wrought turnings, $4; axle turnings, $5.50 to $6; mixed steel, heavy, $6.25; stove plates, $6; heavy melting steel, $7.50 to $8.

PITTSBURG.

OFFICE OF *The Iron Trade Review*,
807 TRADESMEN'S BUILDING, May 19.

In finished material interest has centered in beams. The open market does not as yet cause any rush of buyers, nor is it likely until prices settle. Other shapes that have been depressed heretofore to offset high priced beams have recovered somewhat and quotations are firmer. Other finished lines show little change other than a low priced transaction in grooved steel skelp. Bessemer iron and steel billets are exciting but little interest. Duquesne and the old rail mill at Edgar Thomson have been put on standard sections of rails. Specifications generally are discouragingly slow. Nothing is to be expected from the Montreal bridge order for the present. The price at which this order was said to have been taken proves to have been lower than the actual.

PIG IRON.—Notwithstanding reports to the contrary, valley iron is again being marketed in Pittsburg but at prices but little below Pittsburg iron. A sale is reported at $8.95 in the valley—speculative iron on which storage had run out—and 5,000 tons are said to have been taken at this figure. Pittsburg quotations are $9.20 to $9.30. Pittsburg iron can be had at certain furnaces for $9.25 but others are maintaining a furnace quotation of $9.50, which is also quoted by some valley furnaces. There seems to be no bottom to foundry and mill iron prices. No. 2 foundry is weakest and $9 to $9.25 is quoted. Little is known regarding gray forge but $8.50 to $8.65 are prices asked. Quotations on Pittsburg delivery follow:

Bessemer	$ 9.20 to $ 9.50
No. 1 Foundry	10.25 to 10.50
No. 2 Foundry	9.25 to 9.40
No. 3 Foundry	8.75 to 9.00
Gray Forge	8.50 to 8.65

BILLETS.—An inquiry for tin plate bars to the amount of 5,500 tons a month during 1897 comes from Indiana, but has received only passing attention by reason of the freight handicap. Bessemer billets may be had at $14 delivered in Pitts-

burg and are offered at $13.50 by valley mills. Mills are working very close to specifications and must stop if the present indisposition to specify continues. Rumors of low prices on open-hearth billets are persistent, in spite of rigid mill quotations of $16 to $16.50.

IRON AND STEEL SKELP.—The transaction of the week in skelp is a sale of 5,000 tons of grooved steel skelp at 85c Pittsburg and carrying a commission of 50c per ton. Quotations are as follows: Grooved steel skelp, 90c to 92c; sheared steel skelp, 1c to 1.05c; grooved iron skelp, 1c to 1.05c; sheared iron skelp, 1.15c to 1.20c.

RAILROAD AND TRACK MATERIAL.—The Duquesne Steel Works are finally running on rails and the old rail mill at Edgar Thomson, formerly equipped for light rails, is also turning out 65-pound sections. Specifications of late have been more prompt, and splice bars are being called for likewise. Track material quotations are lower, as follows: Splice bars, 1.10c to 1.15c; track bolts, iron, 1.65c to 1.70c; steel spikes, 1.45c to 1.55c. Links and pins are quoted at 1.20c to 1.25c.

STRUCTURAL MATERIAL.—Until the market regains its equilibrium buyers of beams promise to delay purchases. Many have been holding off in anticipation of last week's break in beams, and predictions are that a considerable tonnage will be wanted at once. Quotations on beams and channels at present are 1.25c, base, for Western business, and 1.15c in the East. Angles and plates, without the equalizing effect of a high beam price, are higher and 1c is asked for both. Zees and tees are unchanged at 1.25c to 1.30c. Jones & Laughlins get the 1,400-ton contract for a Syracuse office building.

MERCHANT STEEL.—New business is in very small lots. Time contracts are being made and prices ruling shade the quoted figures that follow: Soft steel bars, 1.20c; spring, 1.20c to 1.25c; open-hearth spring, 1.30c to 1.35c; machine straightened tire, 1.20c to 1.30c; toe calk, 1.30c to 1.40c; machinery steel, 1.30c to 1.35c, base; sleigh shoe, 1.20c to 1.25c. Tool steel, common, 5c to 7c; special brands, 10c up.

PLATES.—Bessemer plates are selling much below open-hearth and are not in as heavy demand. Quotations are made as follows: Bessemer tank, 1c to 1.05c; open-hearth, 1.10c to 1.15c; shell, 1.20c to 1.25c; flange, 1.30c to 1.35c.

PIPE AND TUBES.—One of the leading pipe interests records more orders last week than for any week in over two years. For the most part orders call for very small lots, but the aggregate tonnage shows a handsome increase over recent weeks. Quotations follow: Merchant pipe, 57 to 67 per cent; galvanized, 50 to 55 per cent; on carload lots six tens; less than carload lots, five tens and five per cent. Six tens and five per cent can be done on carload lots. On merchant boiler tubes prices are made as follows: Two and a quarter inches and smaller, 70 and 10 per cent discount; two and a half inches and over, 75 and 5 per cent discount; casing, inserted joints, 57½ per cent discount; screw and socket joint, 62½ per cent discount.

BARS.—Some Pittsburg mills are joining in the cutting of bar iron prices and 1c to 1.10c has been done by mills heretofore asking 1.15c to 1.20c. The lively competition with steel keeps up and steel bars below 1c are not hard to find. Muck bar is quoted from $17.50 to $18 and is reasonably firm.

SHEETS.—The prospect of wage difficulties is leading buyers to look ahead and a stiffening of quotations on orders running beyond July 1st has resulted. For prompt delivery the quoted prices following may be had: No. 26, 1.80c to 1.85c; No. 27, 1.90c to 1.95c; No. 28, 2c to 2.05c. It is hinted that the Sheet Manufacturers' Association may not long continue in its present shape, but there has as yet no action been taken. Tin plate developments of the week were only routine.

OLD MATERIAL.—Business continues of the "pick up" order. A lot of old steel rails sold at $9.25 and another lot of similar material—fit, however, for relaying—brought but $9.35. Cast scrap has sold at $8.75 in the week and No. 1 wrought scrap for Western delivery at $12, net. Other quotations follow: Hammered iron axles, $14 to $14.50; leaf steel, $11 to $11.25; coil spring, $9.15, gross; mixed lengths of steel rails, $9 to $9.25; old iron rails, $12 to $12.50.

IN OTHER MARKETS.

[SPECIALLY REPORTED FOR THE IRON TRADE REVIEW.]

Cincinnati. The more hopeful feeling prevailing for a week is based on the fact that inquiries have been received from several large buyers, who evidently believe that this is an opportunity to cover their probable wants during the next four to six months. So far as can be ascertained, stocks of iron in the South are not accumulating. Reports received show that one of the well-known Alabama companies has a larger tonnage of orders booked now than at any previous time in its history, and production will be decreased on account of a portion of the plant being stopped for repairs. It is also stated that other Southern furnaces will blow out because of inability to produce iron at current prices. In the North, it is believed producing capacity will be lessened by more furnaces banking or blowing out soon, and it is hoped consumption will overtake production in the next 30 days. Collections continue fairly good and failures among iron works are very rare, notwithstanding the forebodings of some who say it is not possible for iron consumers to continue selling their product at present figures without many failures during the summer. We quote below pig iron prices, f.o.b. cars Cincinnati: Southern coke, No. 1 foundry, $9.25 to $9.50; No. 2, $8.50 to $8.75; No. 3, $8.25 to $8.50; gray forge, $8 to $8.25; mottled, $8; No. 1 soft, $8.75 to $9; No. 2, $8.50 to $8.75; Hanging Rock charcoal, No. 1, $14.50 to $15.50; Tennessee charcoal, No. 1, $12.50 to $13; Jackson Co. silvery, No. 1, $12.50 to $13; standard Georgia car wheel, $14.25 to $15; Tennessee car wheel, $13 to $14. Some recent structural business let in this market foreshadowed the break in the beam pool, very low prices being made on plates and angles. In bars and sheets, the demand is still discouragingly small. Old material is nominally on a basis of $10, net ton, for No. 1 railroad wrought scrap and $9 for old car wheels.

Philadelphia. Low prices seem to get lower, rather than to recover. The breaking of the beam pool was not unexpected, after the cuts in prices made on one or two Eastern contracts of two weeks ago. Quotations on beams now range from 1.20c to 1.30c up to 15 inches. Plate mills are making lower prices and 1.10c to 1.15c delivered is now current, as against like prices at mill ten days ago. Bars are at the lowest point, quotations ranging 1.10c to 1.15c for refined iron bars, 1.10c to 1.20c for steel bars, and 1.20c to 1.25c for best refined iron. Billets are quoted $16 for Bessemer, but mills that go into the market for steel cannot compete on the cent-a-pound basis for finished material. Pig iron appears to be at bottom and as sellers have given away all the Southern freight reduction, there does not seem to be room for any further shrinkage. Seaboard quotations are $12 to $12.50 for No. 1X foundry, $11 to $11.50 for No. 2X foundry, $10.75 to $11 for No. 2 plain, $10.25 for standard mill iron and $9.75 for ordinary mill iron.

MILLER, WAGONER & BENTLEY, who have been in the pig iron business in Columbus, O., for several years past, and who have recently opened an office at St. Louis, have just taken an office at 1505 Monadnock Block, Chicago, under the management of John J. Wagoner. The firm has just been made agent for the sale of the Sheffield brand of Alabama pig iron, and this has made necessary the various offices recently opened. Miller, Wagoner & Bentley are offering Alabama and Tennessee coke irons, Lake Superior coke irons, high silicon silveries, Ohio Hanging Rock charcoals and Tennessee charcoal irons. They also handle Connellsville and West Virginia foundry coke. The various brands of irons for which they are agents are Wellston, Lake Superior coke; Ohio Scotch, Sheffield, Southern coke; Chattanooga, Southern coke; Rosedale, high silicon; Globe, high silicon; Tropic, high silicon; Bloom and Madison, strong foundry, charcoal, made of Ohio ores; Jefferson, warm and cold blast charcoal; Vesuvius, cold blast charcoal; Napier, warm and cold blast charcoal, made of Tennessee ores. Mr. Wagoner has had several years' experience in the pig iron business, and with his excellent line of irons, will undoubtedly be able to secure a good share of the business in the Chicago territory.

THE puddlers employed at Spang, Chalfant & Co.'s Etna mill refused to go to work last Monday morning at the $4 puddling rate. The puddlers at the National Tube Works are still out.

A CHARTER has been granted to the Uniontown Radiator Co., of Uniontown, Pa., for the manufacture of radiators for steam and hot water heating. Capital is $25,000. A plant will be built.

THE IRON TRADE REVIEW

DEVOTED TO IRON AND STEEL MANUFACTURE, FOUNDRY AND MACHINERY TRADES.

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ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

MAY 20, 1897.

A PHASE OF THE INDUSTRIAL REVOLUTION.

Something is to be inferred as to the sort of thinking manufacturers are doing nowadays, by the utterances of representative men among them, in the trade gatherings held from time to time. The convention of foundrymen at Detroit last week, for example, gave indication of the drift of sentiment in an important industrial line. It is interesting to note that the matters emphasized in the president's address and those that were given prominence as prime objects of united effort belong to the domain of industrial sociology. While the informal interchange of experience that always comes with such meetings brought out the common complaint of unremunerative prices, not a word was said on that subject in all the discussions. Shorter hours of labor, a system of apprenticeship that shall give the most intelligent body of molders, and some plan by which expensive and demoralizing conflicts between employer and employes may be avoided—these were the subjects proposed either for legislation by the association, or for the making of sentiment with a view to future action.

In the call for the first National convention of foundrymen, at Philadelphia, last year, the ruinous cutting of prices was emphasized as an evil that needed united effort to find and apply a remedy. The fact that price maintenance has now dropped from sight as a possible field of operation for an association is significant. It seems to be recognized that the lower prices that have marked the depression, going lower than ever in the past year, are not a passing phase of "hard times," but are the product of an evolution—that is now coming to be recognized as a revolution—and that it is vain to build up hopes of a return to old conditions. Thus the address of Martin Fox, president of the molders' union, in advocacy of an eight-hour workday, was a logical sequel to the address of President Schumann, with its emphasis on the great changes which are immediately in store for foundrymen, in common with manufacturers in all lines.

The inference from the considerations urged in President Schumann's address is that a long time may be expected to elapse before productive capacity can be employed to an extent measuring up to the activity of the decade before 1890. Capital and labor have suffered together—are still suffering keenly—and the result of the experience should be mutual conciliation and a better appreciation by each, of the other's claims. Shorter hours of work were suggested by President Schumann. When W. H. Pfahler, of the committee on defense association, took the floor to introduce the molders' leader, he said that he had not talked with a manufacturer in the past two years, who was not favorable to a shorter work day. President Fox followed with a plea for the eight-hour day as a relief from a persistently excessive ability to produce, and disarmed one line of opposition heretofore, by conceding that a reduction of wages would be a necessary feature of the introduction of the change. Perhaps no phase of the Detroit meeting is more important in its possibilities of practical outcome than these expressions from representatives of employers and employed, in favor of united effort to bring about this change that has been agitated in a more or less haphazard way for more than 20 years.

It is not strange that the passing of American industry from a regime of alternating boom and panic to a basis of steady, conservative operation, with lower prices and narrow margins, should be thought a fit time for capital and labor to seek new adjustments. When demand is abundant and capital is making large returns, it does not welcome propositions that overturn long-existing arrangements; but the overturning is already here, unasked for by either capital or labor, and the problem of readjustment should be solved by co-operation and conciliation. We shall watch with interest the further developments in this important industry, of the plans that have been set on foot by the Detroit convention.

THE usual batch of newspaper editorials has been produced anent the collapse of the beam pool. Among other good things that will result, we are told in one of these sapient deliverances, is that "the small mills, that have been shut out of the market by the big producers for some time, will now have a chance to do business." That is to say, the small beam mills—if there were any in existence—that were not able to get business because the wicked big mills kept the price up so high, will find it possible to live again, now that the big ones have cut the price from $6 to $8 a ton! There is thus one ray of hope out of the general gloom.

ECHOES OF THE FOUNDRYMEN'S CONVENTION.

Great credit for the success of the Detroit convention is due to the energetic and indefatigable secretary, John A. Penton, and the delegates freely gave expression to their satisfaction with the official conduct of the association in the past year. The year just ahead will test the ability of the association to cope with the administrative problems it has decided to take up. If present plans carry, these will have equal place (if not larger) in the activities of the association, with the technical questions that have been emphasized thus far.

The exhibits in connection with the convention were objects of interest, and this feature is likely to become a regular one.

F. B. Stevens, of Detroit, had perhaps the most conspicuous display, occupying a booth with an elaborate outfit of cupola linings, fire brick, crucibles, facings, coke, pig iron, snap flasks, etc. A bench molder in wax, bending over his work, was a realistic feature. Byram & Co., Detroit, showed ladles; Robt. J. Taylor & Son, Philadelphia, crucibles and plumbago products. The J. D. Smith Foundry Supply Co., Cincinnati, had molders' tools arranged on easels and showed foundry facings and blackings, pattern letters, etc. The Whiting Foundry Equipment Co., Harvey, Ill., exhibited a cupola, ladles, pneumatic hoist, a miniature jib crane and photographs of various installations. Other exhibits were those of Lyne Adrians, Grand Rapids, Mich., patent core machine whose operation attracted much attention; J. S. McCormick Co., Pittsburg, supplies; Keystone Coal & Coke Co., Pittsburg, coke; Fanner Mfg. Co., Cleveland, chaplets; Wilbraham-Baker Blower Co., Philadelphia, blower; Burr's Damascus Tool Works, Detroit, molders' tools; Whitehouse & Strong, Kewanee, Ill., lycopode, a substitute for lycopodium; Henry E. Pridmore, Chicago, Pridmore's molding machine, practically operated; E. M. Ayers, Zanesville, O., molding sand; Brown & Sharpe Mfg. Co., Providence, R. I., core oven; Leland & Faulconer Mfg. Co., Detroit, universal wood trimmer; W. J. Keep, Detroit, Keep's test apparatus; Millett Core Oven Co., Brightwood, Mass., core oven; Detroit Emery Wheel Co., Detroit, emery wheels; Buchel Brush Co., New Orleans, patent process brushes; Tabor Molding Machine Co., Elizabeth, N. J., photographs of its new rapper pattern molding machine; P. H. & F. M. Roots Co., Connersville, Ind., blowers.

The Plumbago Club, that has heretofore had a paper existence, on the Limekiln Club order, made itself felt as a promoter of good fellowship. Two receptions by the club, which is composed of representatives of the leading supply houses, gave invited guests some insight into the abounding humor of men whom before they had learned to know chiefly for a worthy zeal in the pursuit of orders.

The following individuals and firms make up the list of contributors to the entertainment fund. Its publication here is by way of recognition of those who, in making the social features of the occasion so thoroughly enjoyable, insured the success of the convention in other particulars:

American Radiator Co., American Blower Co., Art Stove Co., Buick & Sherwood Mfg. Co., Dry Dock Engine Works, Detroit Stove Works, Detroit Steel & Spring Co., Frontier Iron Works, Fulton Iron and Engine Works, Griffin Wheel Co., A. Harvey's Sons Mfg. Co., Sam'l F. Hodge & Co., Jenks & Muir Mfg. Co., Leland & Faulconer Mfg. Co., Michigan Malleable Iron Co., Michigan Peninsular Car Co., Murphy Iron Works, Russel Wheel & Foundry Co., Roe Stephens Mfg. Co., J. T. Wing & Co., Detroit Emery Wheel Co., Geo. W. Cope, F. A. Goodrich & Co., C. A. Strelinger & Co., A. A. Parker & Bro., F. B. Stevens, Carnegie Steel Co., Ltd., Superior Charcoal Iron Co., Co-operative Foundry Co., R. L. Ginsburg & Sons, H. D. Edwards & Co., Gaylord Iron Co., Buhl Sons Co., Byram & Co., C. C. Wormer Machinery Co., and Detroit, Belle Isle & Windsor Ferry Co., Detroit; American Glutrose Works, Wilbraham Baker Blower Co., Wm. Sellers & Co., J. W. Paxson Co., R. B. Seidel, Pedrick & Ayer Co., Rogers, Brown & Warner, Philadelphia; S. Obermayer Co., Cincinnati; Barnum-Richardson Co., Lime Rock, Conn.; Walkerville Malleable Iron Co., Walkerville, Ont.; E. M. Ayers, Zanesville, O.; Ohio Iron & Steel Co., Lowellville, O.; Illinois Steel Co., Ward & Nash, H. E. Pridmore, Whiting Foundry Equipment Co., Aermotor Co., Pickands, Brown & Co., Chicago; Gould & Eberhardt, Newark, N. J., Brown-Bonnell Iron Co., Youngstown, O.; Wm. R. Thomas, New York; N. S. Bartlett & Co., Boston; J. D. Smith Foundry Supply Co., Cincinnati; Buchel Machine Works, New Orleans; Domhoff & Joyce Iron Co., Cincinnati; Hugh W. Adams & Co., New York; Colbert Iron Co., Sheffield, Ala.; Whitehead Bros. Co., New York; Ingersoll-Sergeant Drill Co., New York; Crozer Iron Co., Upland, Pa.; Matthew, Addy & Co., Cincinnati; Davis Coal & Coke Co., Piedmont, W. Va.; Springfield Facing Mills, Springfield, Mass.; Dayton Coal & Iron Co., Cincinnati; Washington Coal & Coke Co., Pittsburg; T. P. Kelly & Co., New York; J. S. McCormick Co., Pittsburg; Tabor Mfg. Co., Elizabeth, N. J.; McCullough-Dalzell Co., Pittsburg; Brown & Sharpe Mfg. Co., Providence, R. I.; Rogers, Brown & Co., Cincinnati; Spearman Iron Co., Sharpsville, Pa.; Syracuse Chilled Plow Co., Syracuse, N. Y.; Clinton Iron & Steel Co., Pittsburg; Perkins & Co., Sharpsville, Pa.; Stewart Iron Co., Cleveland Facing Mill Co., Gobeille Pattern Co., Pickands, Mather & Co., M. A. Hanna & Co., Cleveland.

[At Canton, O., the Wrought Iron Bridge Co. has reduced wages from 5 to 10 per cent.

CONDITION OF BLAST FURNACES OF U. S.*

May 1, 1897.

Location of Furnaces.	Coke and Anthracite					Charcoal.				
		In Blast.		Out of Blast.			In Blast.		Out of Blast.	
	Total No. of Stacks.	Number.	Weekly capacity.	Number.	Weekly capacity.	Total No. of Stacks.	Number.	Weekly capacity.	Number.	Weekly capacity.
New York	20	3	3759	17	10650	5	0	0	5	552
New Jersey	8	1	859	7	3622	.....	.....	.....	.....	.....
Spiegel	3	2	326	1	100	.....	.....	.....	.....	.....
Pennsylvania:						13	0	0	13	745
Lehigh Valley	37	9	5499	28	12158	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	70	.....	.....	.....	.....	.....
Schuylkill Valley	24	6	4931	18	8482	.....	.....	.....	.....	.....
Upper Susqu. Val	6	3	2063	3	1469	.....	.....	.....	.....	.....
Lower Susqu. Val	9	2	1474	7	3602	.....	.....	.....	.....	.....
Spiegel	1	1	315	0	0	.....	.....	.....	.....	.....
Lebanon Valley	13	5	3446	8	4264	.....	.....	.....	.....	.....
Pittsburgh	26	21	47997	3	4757	.....	.....	.....	.....	.....
Spiegel	2	2	1139	0	0	.....	.....	.....	.....	.....
Shenango Valley	16	6	9200	10	7877	.....	.....	.....	.....	.....
Jun. and Con. Vals	13	4	5785	9	4976	.....	.....	.....	.....	.....
Spiegel	1	1	1156	0	0	.....	.....	.....	.....	.....
Youghiogheny Val	3	1	1458	2	1900	.....	.....	.....	.....	.....
Miscellaneous	4	2	1328	2	1164	.....	.....	.....	.....	.....
Maryland	5	2	3412	3	3870	4	0	0	4	538
Wheeling District	8	5	6400	3	3543	.....	.....	.....	.....	.....
Ohio:						9	0	0	9	844
Mahoning Valley	11	3	5452	8	9307	.....	.....	.....	.....	.....
Central & Northern	10	7	9191	3	3383	.....	.....	.....	.....	.....
Hocking Valley	12	0	0	12	5120	.....	.....	.....	.....	.....
Hanging Rock	12	4	1396	8	3115	.....	.....	.....	.....	.....
Indiana	2	0	0	2	408	.....	.....	.....	.....	.....
Illinois	14	12	20582	4	7150	.....	.....	.....	.....	.....
Spiegel	1	1	1428	0	0	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	0	0	4	3985	2	0	0	2	1159
Missouri	2	0	0	2	740	1	0	0	1	368
Colorado	3	0	0	3	4620	.....	.....	.....	.....	.....
Virginia	24	8	5675	16	8437	4	0	0	4	437
Kentucky	6	1	355	5	3000	3	0	0	3	200
Alabama	39	15	17372	24	16500	12	1	262	11	2594
Michigan	.....	.....	.....	.....	.....	16	7	2469	9	3833
Tennessee	13	6	4501	7	3830	9	1	359	8	2310
Georgia	2	0	0	2	960	3	1	275	2	360
North Carolina	2	0	0	2	600	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	2	163	9	882
Texas	.....	.....	.....	.....	.....	4	1	203	3	790
Utah	.....	.....	.....	.....	.....	1	0	0	1	175
Oregon	.....	.....	.....	.....	.....	1	0	0	1	275
Totals	318	133	166799	225	144588	98	13	3729	85	16062

SUMMARY.

Fuel.	In Blast.					Out of Blast.			
	Number.			Weekly Capacity.			Number.	Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.			Month Previous.
Charcoal	13	16	16	3,729	5,368	4,760	85	82	16,062	14,799
Coke and Anthracite	133	137	180	166,799	167,911	184,631	225	223	144,588	145,771
Total	146	153	196	170,528	173,279	189,398	310	305	160,650	160,570

*The above table is condensed from the *Iron Age*. The tables of the *American Manufacturer* show in blast May 1, 145 furnaces, with 170,737 tons weekly capacity instead of 170,528 as above.

The First Lake Superior Ore Shipment.

TO THE EDITOR:

Permit me to dispel the inference that may be drawn from the closing lines of Mr. Reese's letter in your issue of the 29th ult. On page 324 of the second edition (1892) of Swank's "Iron in All Ages," Mr. Swineford states that the first shipment of iron ore from the Lake Superior region was made in 1850, and was taken by A. L. Crawford. Mr. Reese may perhaps be correct as to the date of the first cargo, and it is possible A. L. Crawford got 10 tons of it also, as Mr. Reese says; but of this I have no knowledge. True, the 1850 shipment was only a few tons, but nevertheless it was the *first*, and no further infringement on your valuable space should be required to firmly establish the fact.

St. Louis, May 4. HUGH A. CRAWFORD.

THE Ball-Bearing Co., manufacturer of ball and roller bearings for all kinds of machine construction, has opened a New York office at 1318 American Tract Society Bldg., corner Spruce and Nassau streets. F. T. Tapley will be in charge of the New York business.

THE Duquesne Steel Works of the Carnegie Steel Co., Ltd., began rolling rails Sunday night.

ANOTHER INROAD ON THE LOCOMOTIVE.

The New York, New Haven & Hartford Railway Co. has made another advance in the operation of its road, in the electrical equipment of its line running from Berlin to New Britain on the New Haven system, Hartford Division, and from New Britain to Hartford, on the New England system, Springfield Division. The first electric car was officially run over the electrically equipped track on the 11th inst. by Col. N. H. Heft, the chief of the electrical department of the N. Y., N. H. & H. R.R., in the presence of the president, C. P. Clark, vice-presidents Hall and Mellen, the directors and other prominent officials of the New Haven and New England systems.

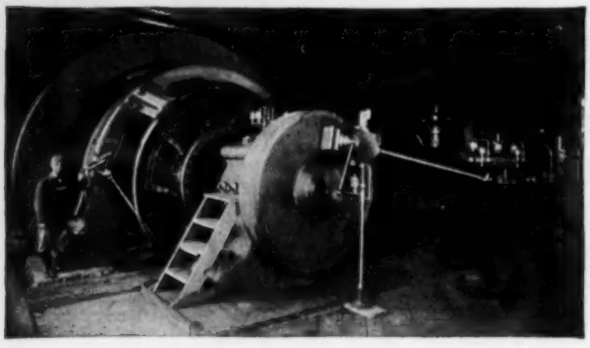


FIG. 1.—850 KILOWATT DYNAMO DIRECT CONNECTED TO 1,200 H. P. ENGINE.

FIG. 2.—VIEW OF BOILER ROOM.

The importance of this step can hardly be gauged. Unlike the experiments at Nantasket and East Weymouth, this length of the newly equipped line gives it an appearance of permanence, which removes it from the region of experiment; and while it is still difficult to predict with any assurance of immediate realization that the locomotive of to-day will be superseded, operation of this line successfully, from the point of view both of electrical efficiency and financial economy, will go far towards hastening the larger use of electricity in place of the motive.

This is the longest section of any railroad in the world, hitherto exclusively operated by steam locomotives, to be equipped for electric traction. The total distance is 12.3 miles divided in two parts, the first running from the power house at Berlin, the second extending from New Britain to Hartford. The road from Berlin to New Britain is single track; from New Britain to Hartford double track, the eastbound track only being devoted to electric service.

In the operation of this road the electric trains will run from Berlin to New Britain and back. The trains from New Britain to Hartford and back will run as a separate service, the change of cars being made at New Britain. This system differs in its electrical equipment from that at Nantasket, in that trolley contact is not used. The third rail system is adopted, the conductor or third rail being laid along the center of the track between the running rails.

The power station of the New York, New Haven & Hartford Railroad is a brick and stone building, two stories high, divided by a central wall into two parts, boiler room and engine room. It is 113 feet long and 102 feet wide, exclusive of a bay. The boilers are ten in number, each of 300 h. p. They are tubular boilers and are set in two batteries of five each. In the construction of the boiler front a new method is followed, devised by Col. N. H. Heft, chief of the electrical department of the Consolidated road, who has carried out the

FIG. 3.—TRAIN, ONE MOTOR CAR AND ONE PASSENGER COACH.

entire electrical installation. The entire boiler front is capable of being taken down without disturbing the rest of the boiler setting, the front being bolted to a plate attached to the dividing wall instead of to the wall itself. This innovation will be readily appreciated.

There are two feed-water pumps, either pump being capable of supplying water to both batteries at once. The piping from the boilers is in duplicate and will be covered with non-conductive covering. The flues enter a brick stack 125 feet high, located immediately in the rear of the center of the present building. The coal used is known as locomotive sparks, the burning of which has given considerable satisfaction at the Stamford station. It is taken directly from the trucks in the rear of the station and is emptied into a large bin running along the back of the building.

The engine section of the building is divided into two stories, the upper one of which will contain the engines and dynamos. One engine is in place, the foundations are in for another, and a third will be added as soon as demand warrants. The projected extension of the building will hold three more, and as each engine will have a capacity of 1,200 h. p. the total capacity of the station when completed will be 7,200 h. p. nominal, which can readily be raised to 12,000 h. p. The engine at present in position is a Greene-Corliss improved cross-compound, condensing, built by the Providence Steam Engine Co. It is rated at 1,200 h. p. nominal, with dimensions 28 x 48 x 48 x 4-foot stroke, running at 100 revolutions per minute.

To the engines is directly connected a General Electric Co. standard 10-pole 850 kilowatt generator of the iron clad type. The dynamos are over compounded and furnish current at 600 volts, no load, and 650 volts full load. A traveler with two cranes, one of 35 tons, the other of five tons capacity, runs the length of the engine room. It was built by the Berlin Iron Bridge Co., which furnished the steel roof trusses. From the switchboard run four cables, each of 850,000 circular mils cross-section, to the third rail.

The third rail is similar in shape and weight to that used on the stretch of track between East Weymouth and Nantasket Junction on the South Shore branch of the Plymouth Division of the N. Y., N. H. & H. R. R. In cross-section it resembles a flattened "A" and weighs 93 lbs. to the yard. It is laid upon blocks of wood impregnated with insulating material. The blocks are only about one-half as high as those used at East Weymouth, allowing 1⅝ inches from the eave of the third rail to the tie, and in some places only 1½ inches. This reduction in the height of the insulating block is due to the fact that no greater height could be allowed in view of the height of the service rails.

The top of the third rail is about an inch higher than the level of the tops of the running rails. The conductors are bonded, not by the ordinary leaf or tranded copper bond, but by plates of sheet copper ⅛ inch thick, 12 inches long and 4½ inches wide. On the Berlin branch are four grade crossings; on the New Britain & Hartford line, 18. At all of these crossings the third rail is omitted, the circuit being continued underground by stranded bare copper cables.

The motor equipment will consist at first of five motor cars. These are open cars, 50 feet in length, used last season at Nantasket, but deprived of the trolley. Each car weighs about 32 tons. Each is equipped with two G. E. 2,000 motors and two L series parallel controllers. Each motor car is fitted with air brakes, two gongs and a chime whistle.

Air for the brakes and whistle is furnished by a vertical double cylinder air pump, driven by a motor automatically controlled by special switch, which is opened when the pressure in the main tank reaches 60 lbs., and closed when it falls below that. Contact is made with the third rail by means of sliding shoes. These are of cast iron, 12 inches long and 4 inches wide, weighing about 20 lbs. They are suspended by two links from a casting fastened to a beam set immediately beneath the king pin of each truck, connection between motor and shoes being made by flexible cables. The distance between the two shoes is about 33 feet. Many of the grade crossings are wider than this, and to avoid carrying the train over the crossing by momentum another shoe is fitted to each truck of the second car of the train, a connection running from this shoe to the motors. Thus, by the time the last shoe has left the third rail at one end, the first shoe is in contact with the next section of the rail.

NATIONAL CONVENTION OF FOUNDRYMEN.

From nearly all points of view the Detroit convention of the American Foundrymen's Association was a notable success. The outturn of technical information was greater than that of the Philadelphia meeting of a year previous and the social features will long be memorable. The legislative outcome, while it may not have been all that some of the membership had hoped for, was important in giving definiteness to the plans of the association and marking out lines on which the advances of the coming year are to be made. The impressions of Detroit hospitality that the visitors bore away vie in vividness with those of the beauty and cleanliness of the most charming of American cities. With a small local contingent, as compared with the strong and organized body that handled the Philadelphia convention, the Detroit foundrymen have cause to be proud of the week's record. It more than met expectations and in maintaining the strong pace of the year previous, settled the high standing the annual foundrymen's gatherings are to take among technical and trade conventions of the year. Philadelphia in 1896 was able to furnish a creditable convention attendance from her own and neighboring foundries and therefore had a larger convention enrollment. Detroit, while having a smaller local turnout, drew well from Central Western points, besides getting a fair representation from the East. The enrollment is given below, classified by States for greater convenience in reference, and to indicate the territorial distribution of the attendance:

MICHIGAN.

Detroit.—Oliver Phelps, P. R. Evans, Jos. F. Disney, J. G. Johnston, Michigan Peninsular Car Co.; J. R. Russel, Russel Wheel & Foundry Co.; J. Springer, Frank L. Deane, Michigan Brass & Iron Co.; John A. Penton, Henry Hansen, *Foundry;* T. H. Simpson, A. Cochrane, W. Lemon, David Brennan, Michigan Malleable Iron Co.; Wm. Stridiron, Berry Bros. Mfg. Co.; John Smith, Jr., John Kershaw, S. F. Hodge & Co.; F. A. Goodrich, C. S. Bacon, S. P. Bacon, F. A. Goodrich & Co.; Wm. Gerhauser, Superior Charcoal Iron Co.; Geo. H. Barbour, W. J. Keep, F. W. King, Michigan Stove Co.; H. M. Leland, B. Gomersall, R. C. Faulconer, H. W. Cheney, Wilfred Leland, Leland & Faulconer Mfg. Co.; Wm. Scott, Roe Stephens Mfg. Co.; E. Moliter, D. Moliter; Lee Burt, Union Iron Co.; Geo. W. Cope, Cope Pattern Works; L. A. Crandall; F. B. Gaylord, N. Woods, Gaylord Iron Co.; James Inglis, American Blower Co.; H. G. Lobenstine, Crescent Brass & Iron Works; John O. Campbell, J. W. Weldon, W. H. Fernwood, N. E. McMullan, Art Stove Co.; E. A. Sumner, American Radiator Co.; F. B. Stevens, J. J. Hoffman, M. Z. Fox, E. J. Woodison, and B. F. Carpenter, F. B. Stevens; D. H. Roberts, McRae & Roberts Co.; S. H. Morris, Detroit Furnace & Heater Co.; John Trix, American Injector Co.; M. A. McPherson, E. S. Bryant, Frontier Iron Works; E. E. Mains, Detroit Steel & Spring Co.; Robert Smith, Frank Dunn, A. G. Matson, Dry Dock Engine Co.; F. G. Christian and Henry Keep, Fred Kahl; J. W. Noller, H. E. Culverwell and J. H. Burr, Burr's Damascus Tool Works; A. A. Parker and B. W. Parker, A. A. Parker & Bros.; C. J. Stuart, Co-operative Foundry Co.; —.Calvert, J. Calvert's Sons; Theo. P. Byram, Byram & Co.; D. H. Roberts, McRae & Roberts Co.; E. A. Wales, Griffin Wheel Co.

Grand Rapids.—Henry J. Hartman; Lyne Adrians, Butterworth & Lowe.

Bay City.—James Gilbert, McKinnon Mfg. Co.

Kalamazoo.—Chas. Clarage, J. F. Rue, Thos. Clarage & Son.

Jackson.—E. Dennis, Dennis Machine Co.

Eaton Rapids.—Arthur D. Gallery, T. M. Bissell Plow Co.

Houghton.—Chas. J. Hodge, Lake Superior Iron Works.

Battle Creek.—John T. Thompson, Advance Foundry.

Coldwater.—Thurlow Titus.

OHIO.

Cleveland.—Chas. Seelbach, Forest City Foundry & Mfg. Co.; T. H. Gartland, Gartland Foundry Co.; J. L. Gobeille, Gobeille Pattern Co.; A. I. Findley, *The Iron Trade Review;* L. N. Allen, Standard Foundry & Mfg. Co.; Frank H. Chamberlain, Cleveland Facing Mills Co.; Thomas Wathey, Walker Mfg. Co.; Walter Rutson, M. F. Martin, Cleveland Foundry Co.; W. H. Henderson, B. C. Trago, Henderson & Trago; Hopkins Williams, W. W. Sleigh, Fanner Mfg. Co.; C. J. Langdon, Fulton Foundry Co.

Cincinnati.—J. D. Smith, W. T. White, J. D. Smith Foundry Supply Co.; John Hill, S. H. Merrick, S. Obermayer Co.; Geo. M. G. Morris, John B. Morris Foundry Co.; J. K. Pollock, Rogers, Brown & Co.; W. W. Hearne, Matthew Addy & Co.

Springfield.—J. G. Sadlier, Springfield Foundry Co.; F. M. Bookwalter, James Leffel & Co.

Columbus.—C. S. Reynolds, C. S. Reynolds & Co.
Hillsboro.—C. S. Bell, C. S. Bell Co.
Zanesville.—U. N. Kanavel, E. M. Ayers.
Canton.—W. E. Sherlock, Novelty Iron Co.
Galion.—J. R. Homer, Galion Foundry Co.; D. W. Gordon, Ohio Sand Co.
Hamilton.—Felix Kahn, F. & L. Kahn & Bros.
Addyston.—S. S. Knight, Addyston Pipe & Steel Co.

PENNSYLVANIA.

Philadelphia.—Francis Schumann, Tacony Iron & Metal Co.; Howard Evans, J. W. Paxson Co.; C. T. Holbrook, Davis Coal & Coke Co.; Chas. T. Wilson, Wm. Sellers & Co.; J. S. Wilbraham, Wilbraham Baker Blower Co.; John M. Warner, Rogers, Brown & Warner; J. H. Pepper, *Iron Age;* Thos. Devlin, Thos. Devlin & Co.; W. H. Pfahler, Abram C. Mott, Abram Cox Stove Co.; Walter Wood, R. D. Wood & Co.
Pittsburg.—Wm. Yagle, Wm. Yagle & Son; Roy Wise, J. C. Reed, Edward Pitcairn, E. M. Gross, W. M. Singer, Keystone Coal & Coke Co.; John Meighan, Dawson Bros. & Meighan; J. M. Ryan, McConway & Torley Co.; S. D. Sleeth, Westinghouse Air Brake Co.; John A. Logan; T. E. Malone, W. M. Wilson, J. S. McCormick Co.; S. R. Baldwin, John S. Graham, P. W. Zieg, Baldwin & Graham; Isaac W. Frank, Wm. Metcalf, Jr., Frank-Kneeland Machine Co.; N. P. Hyndman, Washington Coal & Coke Co.
Allegheny.—C. W. Jones, Rosedale Foundry Co.; S. Groves, Taylor, Wilson & Co.
Sharpsville.—Thos. D. West, T. D. West Foundry Co.
Monongahela.—S. B. Robinson, Robinson Machine Co.
Waynesboro.—Jesse R. Oller, Jas. P. Lowell, B. F. Oller, Geiser Mfg. Co.; L. D. Gilbert, Frick Co.
Marietta.—Geo. F. Stibgen, Marietta Casting Co.
Drifton.—John Rohland, Coxe Iron Mfg. Co.
Oil City—J. E. Fisher, National Transit Co.
Erie.—Alex. Jarecki, Jarecki Mfg. Co.
Johnstown.—A. D. Hasbrouck, Johnson Co.
Sharon.—W. H. Palmer, J. D. Groff, Globe Electric Co.
Washington.—B. D. Northrup.

ILLINOIS.

Chicago.—B. T. Bacon, Pickands, Brown & Co.; James S. Winn, Ward & Nash; R. M. Dyer, Aermotor Co.; W. C. Swift, and R. E. Turnbull, H. E. Pridmore; Henry Cribben, Cribben, Sexton & Co.; W. Field, Coffin & Wood; H. S. Vrooman, Garden City Sand Co.; Wm. Ferguson, Gates Iron Works; H. F. Frohman, S. Obermayer & Co.; Chris. J. Wolff, L. Wolff Mfg. Co.; T. A. Hogan, Secy. National Association of Stove Manufacturers; Geo. W. Cope, *Iron Age;* L. R. Rogers, Nickel Plate Stove Polish Co.; G. A. True and S. P. Johnston, Whiting Foundry Equipment Co.; Henry E. Pridmore; James F. Lewis, Rand Drill Co.
West Pullman.—G. H. Carver, Plano Mfg. Co.
Aurora.—F. M. Lyon, Supt. Burlington Route Foundry; Geo. H. Lyon, C. B. & Q. Foundry.
Rockford.—D. E. Trahem, Rockford Brass Foundry.
Kewanee.—Fred. H. Strong and S. A. Whitehouse, Whitehouse & Strong.

NEW YORK.

New York.—T. P. Kelley and Daniel Gallagher, T. P. Kelley & Co.; Henry Gleason; T. S. Kingsley, Eugene Munsell & Co.; J. W. Gardam, Wm. Gardam & Son.
Buffalo.—V. L. Whitehead and A. E. Doak, Whitehead Bros. Co.; E. C. Wheeler and O. P. Letchworth, Pratt & Letchworth.
Rochester.—John F. Brayer, and Frank N. Brayer, Co-operative Foundry Co.
Troy.—W. F. Greene.
Manlius.—W. W. Cheney, S. Cheney & Son.
Medina.—E. A. Beach, Beach & Co.
Albany.—M. J. Powers, Albany Facing Mill Co.
Little Falls.—Wm. H. Switzer, Superior Foundry Co.
Auburn.—Edwin D. Metcalf, D. M. Osborne & Co.
Hoosick Falls.—Jas. A. Beckett, Walter A. Wood Co.
Port Chester.—J. F. Mills, Abendroth Bros.

MASSACHUSETTS.

Boston.—F. W. Gibby, Mechanics' Iron Foundry Co.; Geo. H. Lincoln, Geo. H. Lincoln & Co.; J. E. Radford, American Tool & Machine Co.; T. F. A. Lutterman; E. N. Foss, B. F. Sturtevant Co.; Arthur W. Walker and Bartlett M. Shaw, Walker & Pratt Mfg. Co.; M. M. Whipple, American Tool & Machine Co.; Geo. H. Gibby, Condor Iron Foundry Co.
Worcester.—Geo. B. Buckingham, Arcade Malleable Iron Co.
Charlestown.—E. P. Osgood, Osgood & Hart.
Lowell.—F. A. Flather and Geo. B. Smith, Lowell Machine Shop.
Wakefield.—J. M. Skulley, Smith & Anthony Co.
Watertown.—Robert Blyth, Walker & Pratt Mfg. Co.
Taunton.—W. E. Walker, Weir Stove Co.
Westfield.—John R. Reed, H. B. Smith Co.
Lawrence.—J. F. Lanigan, Davis Foundry Co.
Springfield.—L. S. Brown, Springfield Facing Co.

RHODE ISLAND.

Providence.—R. Vial and E. J. Lyon, Brown & Sharpe Mfg. Co.; Wm. H. Carpenter, A. Carpenter & Sons Foundry Co.; A. J. Miller, Whitehead Bros.

CONNECTICUT.

Hartford.—A. L. Carlton, Pratt & Whitney Co.
Bridgeport.—C. M. Choate, Bridgeport Deoxidized Bronze & Metal Co.; C. D. Miller, Wilmot & Hobbs Mfg. Co.
Bristol.—W. E. Sessions, Sessions Foundry Co.

VERMONT.

Montpelier.—J. J. Burgen, Lane Mfg. Co.

NEW JERSEY.

Newark.—D. F. O'Brien, A. P. Smith Co.; Edwward Maher & Flockhart.
Patterson.—Twining Campbell; James Eastwood, Benj. Eastwood.
Elizabeth.—E. H. Mumford, Tabor Mfg. Co.
Jersey City.—John A. Walker, Jos. Dixon Crucible Co.; J. N. Matlock, A. A. Griffing Iron Co.

WEST VIRGINIA.

Powellton.—D. T. Evans, Mount Carbon Co., Ltd.

LOUISIANA.

New Orleans.—A. H. Swanson, Whitney Iron Works Co.; G. F. Cocker, Buchel Brush Co.

TENNESSEE.

Chattanooga.—E. H. Putnam, *Tradesman,* and Chattanooga Chilled Plow Co.

INDIANA.

Connersville.—D. T. Roots, P. H. & F. M. Roots Co.
Fort Wayne.—John Kane and G. L. Haskins, Kerr-Murray Mfg. Co.

WISCONSIN.

Milwaukee.—E. K. Rundle, Rundle-Spence Mfg. Co.; W. F. Hyde, Brand Stove Co.
Ashland.—M. J. Bourke, Wisconsin Malleable Iron Co.

MISSOURI.

St. Louis.—W. E. Fitch, Peerless Mfg. Co.
Kansas City.—A. G. Southerland, Kansas City Wire & Iron Works.

MINNESOTA.

St. Paul.—Geo. Fuller, Monarch Brake Beam Co.; J. E. Orme, Washington Foundry.
Minneapolis.—Geo. Gane, Washburn-Crosby Co.

CANADA.

Walkerville, Ont.—R. H. Frees, Walkerville Malleable Iron Co.
Montreal, Que.—F. J. Best, Warden, King & Son.
Smiths' Falls, Ont.—Wm. H. Frost, Smiths' Falls Malleable Iron Co.
Sarnia, Ont.—Thos. Doherty, Doherty Mfg. Co.

SWITZERLAND.

Winthertur.—A. Sulzer, Sulzer Bros.

FIRST DAY.

Headquarters were at the Russell House. At the Cadillac the National Association of Stove Manufacturers had sessions on Wednesday and Thursday, preceded on Tuesday by the annual meeting of the Stove Founders' National Defense Association. Some of the stove manufacturers looked in on the early sessions of the foundrymen's convention, but later were occupied with their own proceedings and excursions. At Harmonie Hall, which amply and conveniently accommodated the convention, and the foundry supply exhibits, the first session was held on Monday afternoon, May 11. The attendance was something less than 200. Chairman John R. Russell (Russell Wheel and Foundry Co.) of the local executive committee, spoke a warm welcome, which was an earnest of the excellent entertainment of the three days following. Mayor W. C. Maybury extended a welcome on behalf of Detroit and George H. Barbour reinforced it, representing local foundrymen.

President's Address.

President Francis Schumann, who showed himself, as at the Philadelphia meeting, a tactful presiding officer, and admirable in stimulating and directing the discussion of papers, responded to the welcomes and followed with the presidential address. After referring to the fact that nearly 500 establishments are now represented in the association and to the objects of the organization, President Schumann said:

"The present condition of our industries affords cause for serious reflection. Our productive capacity seems to have outgrown the consumption, our country suffers from lack of proper circulation and want of balance. Capital, senstive to conditions and realizing the precarious nature of its investments, a realization intensified by reason of the low standard of ethics in vogue in corporations, notwithstanding the laws

of the land, has contracted its advances and enforced a lessening of the differences between the actual capital invested and the fictitious amounts upon which business is transacted."

The speaker dwelt for a few moments on the rapid expansion of our industries in the years following the war and gave figures showing the disproportionate enlargement of manufacturing. He continued:

"How can the excessive capacity to produce be controlled and utilized to improve the conditions? It is within the province and is the duty of this body, as well as all similar organizations, to consider this subject and to formulate and give expression to such thoughts as will lead to a satisfactory solution of the problem.

"The lessening of the cost of things, diminishing the burden of labor, making life more pleasant, happy and contented, are all desires that may be satisfied by the use of the steam plow, the mower and reaper, the power loom, the power crane, the molding machine, the wood working machine, the typewriter, and so on indefinitely. That all labor saving machines can and will be beneficial to mankind, cannot be denied—so far however, the greater benefit has been limited to the few, but that the benefit will finally reach the masses, is as true as that mankind is progressing; it will reach them in the lessening of the hours of labor, in bringing within reach things that go to comfort and make man happy, contented and healthful in mind and body.

"Lessening the hours of labor seems to me the most vital question available for immediate application toward the welfare of all, whether employer or employe. Instead of laboring night and day for short periods to meet spasmodic demands, is it not wiser to so adjust the labor as to bring about the equal distribution of work among the many? Is not the lessening of the hours of labor one of the most vital elements to correct the disturbances between supply and demand?

"The cultivation and maintenance of knowledge and skill on the part of those practicing our art is a question paramount in importance to any that may come before us. The adoption of a wise and uniform system of apprenticeship is a necessity generally admitted, and it should receive your careful consideration and action. Equally important is the adoption of methods that will promote intimate and amicable relations between the employer and employe—the golden rule as a guide will readily suggest practical and effective means for bringing about beneficial results.

"The rapid development of mechanic arts in the last decade has demanded and enforced extraordinary efforts on the part of foundrymen to keep apace with the times. The continued growth in exceptional size, quality and form of foundry products, to meet the special purposes intended by the engineer have asserted themselves and compel the application of a knowledge of the sciences far beyond any that our predecessors ever thought of; not only does this apply to the leader, whether superintendent or foreman, but equally to the handicraftsman in all branches of our business.

"We are tending more and more toward normal conditions; we begin to understand the causes of and the remedies that apply to existing evils and having faith in our country and its people, look forward to the future, convinced that we will pass through the evolution now in process, with renewed strength, wiser through the experience of the past."

Secretary Penton presented his report, which referred to the organization of the association a year previous, and to the distracting political campaign that came on immediately afterward, making it unwise to attempt a vigorous canvass for new members. In view of the fact that this work had been restricted to the past few months the secretary considered that to have secured applications for membership from 486 persons was succeeding beyond expectations. As many more firms and individuals have written to say that if the association is a success, or, as some put it, if prosperity returns, they will affiliate with the movement. From dues and from subscriptions to the *Journal* of the association the receipts have been $2,918. There has been paid out for printing, postage, stenographer, rent and supplies, $2,240.06, leaving $677.94 in the treasury, with bills paid to May 1.

The Monday evening session was given up to a paper written by Henry Gretener, formerly of Detroit, now in Switzerland, the title being "A Modern European Foundry." The paper was read by Secretary Penton who illustrated it with 30 lantern slides from photographs taken for the purpose. The foundry referred to is located at Wintherthur, Switzerland, and is owned by Sulzer Brothers. Mr. A. Sulzer, son of one of the proprietors, was present while the paper was read and the views given. He is visiting foundries in various centers in the United States. The Wintherthur plant started in a small way in the '30's. With its associated plants it employs 2,700 men. The paper pointed out some of the excellent features of this big foundry, including the large number of electric cranes, the system of ventilation and light and the use of steam pipes to dry molds.

SECOND DAY.

The report of the committee appointed some weeks previous to the convention, to consider the preparation of a uniform scheme of apprenticeship, was taken up at Tuesday morning's session. The committee consisted of C. S. Bell, Hillsboro, O.; Wm. Ferguson, Chicago, and R. Viall, Providence, R. I. The report was in the main the plan of apprenticeship and the form of indenture prepared largely through Mr. Ferguson's untiring labors for the Western Foundrymen's Association. It provided for four classes of apprentices, namely: Machinery molders, whose term should be four years; stove plate and agricultural molders, term three years; third, bench and brass molders, term two years; fourth, graduates of manual training schools, term to be governed by the ability of the graduate to advance and by the proficiency attained in his school experience. Instead of the provision of the Western Foundrymen's Association report that a portion of the apprentice's wages be withheld until the end of his term, the committee recommended that wages be paid in full and that bonuses be offered payable to apprentices who complete their terms. These were fixed at $100, $75 and $50 to the first, second and third classes, respectively, and a larger sum, not specified, to the training school graduate. It was recommended, also, that no formal indenture be signed until the would-be apprentice had served a probation of eight weeks. A proviso was inserted, too, that an apprentice who had failed to finish his term with one foundryman should not be employed by another, unless it should appear that the arrangement was terminated by reason of the injustice of the first employer.

There was a miscellaneous debate that brought out a diversity of views on the question of apprenticeships, but at length all the committee's recommendations as outlined above were adopted and the committee continued for another year. The scheme as adopted is binding upon no one, but with the endorsement of the association it is expected to be adopted by members as far as practicable.

Defense Association Discussed.

The question about which it was anticipated the most radical differences of opinion would develop, was the proposal to form within the lines of the American Foundrymen's Association an organization for purposes of defense and for the avoidance of labor troubles, or their adjustment, when precipitated. In the informal canvass of this matter, as the members met in the intervals of regular sessions, there were some decided expressions as to the impolicy of such a move. It was argued against it that, while the stove manufacturers had successfully maintained their association, they had done so because the concerns were not numerous, the product was but a single line, and nearly all the firms were large and strong. The diversity of the interests in the association, the fact that only about 12 per cent of the founders in the country were included in its membership, and the widely differing conditions surrounding the production of work in various parts of the country, were urged in opposition to the wider application of the plan. Yet there appeared a strong sentiment among an influential contingent, for some fruit of the association movement more tangible commercially than the discussion of matters of practice and the dissemination of information.

Chairman W. H. Pfahler, of the committee on the defense proposition, reported that the committee was unanimous in believing it desirable to form a defense organization within the association. As a preface to the plan of action which the committee recommended the report says that employes are organized into a vast body and that reason alone suggests the necessity of the employers coming together. The impression is gaining ground that employers are indifferent to the

welfare of their workmen, are seeking to enrich themselves at the employes' expense, and there is distrust and animosity between those whose community of interest should impel them to mutual helpfulness. The injurious effects of srikes were referred to, and it was stated that the molders, by the help of their organization, have frequently conducted these strikes, often bringing to bear against a single shop the influence of thousands of their members, imposing on it unjust conditions, locally and temporarily, and putting grievous burdens upon the proprietors. The necessity was pointed out of perfecting an employers' organization, to give dignity and strength to any arrangements that might be made between proprietors and men, and to any protest that employers might be compelled to offer to unjust exactions. In conclusion the committee says:

"By the courtesy of the officers of the Stove Founders' Protective Association, your committee has been allowed to examine the workings of its plan, which has now been in operation for ten years, and is enabled to declare that it is of inestimable value to its members.

"Through the operation of this plan a bond has been formed so strong that, while the association has protected its members from unjust demands, it has inspired the employees with such a sense of the justice of their employers that it is now a fundamental principle to settle all disputes without the cost of a strike, and to adjust all questions of wages and methods by periodical conferences, in which all the conditions of the business are freely discussed and reason dictates the result. We beg to outline the following suggestions:

"1. The object of the association should be the mutual protection of its members and the adujstment of all disputes with employes, with due consideration for the just interests of both parties to the controversy.

"2. The membership should be confined to principals in and operators of foundries where castings in iron, steel, brass or other metals are made.

"3. The working force of the association should be vested in an executive committee selected from the general membership and in a district committee in each five or six districts into which the country should be so geographically divided as to bring together those foundrymen in whose territory similar customs and conditions prevail.

"4. Each member should contribute to the fund of the association a proportionate part of such sum as may be necessary to defray the working expense of the association.

"5. An emergency fund should be created by special assessments on the members, in proportion to the number of molders employed by each at the time such assessment was levied. This fund should be held intact, for the double purpose of having on hand, at all times, ample funds to meet any demand upon the association, and to create an added attraction, making membership more valuable as the fund increased.

"6. Every member should be free to settle on his own responsibility any dispute arising in his shop, but, having once invoked the aid of the association, he should place the entire settlement in its hands and be required to abide by the decision reached.

"7. In case of dispute, every reasonable effort to settle it without a strike should be made, and if the employes refused to consent and did strike, all the force of the association should be brought to bear to give assistance to the member whose shop was affected, either by procuring men to take the places of the strikers, or by compensating the member for losses incurred in defending the principles at stake.

"8. With these principles as bases, your committee believes that the detailed formation of constitution and by-laws would be easily reached, and could be so adjusted as to work in entire harmony with the laws of the American Foundrymen's Association, thus placing within reach of the members of the latter the privilege of sharing in the unquestionable benefits of the interior organization here outlined."

After reading the report Mr. Pfahler introduced Henry Cribben, of Chicago, vice-president of the Stove Founders' National Defense Association, as one whose experience enabled him to speak with assurance on the benefits of a defense organization. That his view of things was not warped was indicated in the added remark of Mr. Pfahler that Mr. Cribben was originally a molder and one of the charter members of he Iron Molders' Union of America.

Mr. Cribben referred, in opening, to the record of the Stove Founders' National Defense Association. It had been called on to fight not a few battles, and it was able to say that it had never been defeated. Of the relation of employer and employe, as it affected the remuneration of both, he said, in substance: "All manufacturers have to sell their products at market price, which is composed of four prime factors: Materials, expenses, wages and profits. Practically the first and second of these factors are beyond their control, except to a very limited and immaterial extent, as they have to buy at market rates; therefore it is out of the third and fourth that employes are to be paid for their labor. So far as concerns employes, the fourth factor is also prescribed by the average rate obtaining throughout the country, for if it does not average equal to the value of the personal services of the manufacturer, the controlling rate of interest on money and a premium for the risk of capital always incurred, the capital necessary to conduct the business will be withdrawn and there will be no work for the employes. Thus the third factor, which is the wages fund portion of the total net receipts of the product, is actually limited to the difference between the aggregate cost of materials, expenses and profits on the one hand and the net receipts on the other. It cannot be artificially extended. It is the interest of the manufacturer to satisfy his workmen by making this factor of the wages fund as large as possible, in order that their good will may lead them to work steadily and efficiently and produce the greatest output, thereby limiting the rate of expenses; and it is to the interest of the workmen not to seek to make it too large, otherwise it reduces the profit fund and induces the withdrawal of capital, thereby leaving them without employment at all."

Coming to the line of operation of the defense association as indicated by its aims, the speaker said these were: "First, to combine the manufacturers of stoves into a powerful and effective body so competent for defense that these organizations of employes will fear to provoke it; second, to improve the relations of employer and employe by inducing the material co-operation of those who now occupy a position of inert independence, it being easier to improve the environment by removing the inducement to do wrong than by cultivating sentiment, and, third, to educate all concerned, and gradually formulate rules of action whereby disputes will be avoided."

The address was well received and evidently had the effect of changing sentiment, for the expressions made in the groups that discussed it on the afternoon excursion indicated that Mr. Cribben's presentation of the practical side of the defense arrangement had carried weight. Adjournment was taken when Mr. Cribben had finished, as the river ride was appointed for 1.30.

A delightful feature of the meeting was the excursion of Tuesday afternoon. The five hours spent on the river carried the visitors over one of the most attractive portions of a trip up the lakes. There was music on board, and those who desired danced while others found interest in the discussion of questions that were expected to come up in the formal sessions. Just after adjournment at noon, the delegates had been called to order long enough to permit the appointment of a committee of seven to canvass the sentiment of the foundrymen on the proposition to organize a defense association. This committee consisted of W. H. Pfahler, of Philadelphia; Wm. Yagle, of Pittsburg; E. H. Putnam, of Chattanooga; H. M. Leland, of Detroit; Edward Maher, of Newark, N. J.; Alex Jarecki, of Erie, Pa., and J. F. Lanigan, of Lawrence, Mass. On the afternoon trip the committee sounded the members on the subject, and while opposition appeared to the starting of a defense association within the lines of the present organization, there were many who were willing at least to take the initial steps and give the plan a chance to demonstrate its value.

At the evening session of Tuesday a paper, one of the most exhaustive and valuable presented at the meeting, was read by James A. Beckett, superintendent of the Walter A. Wood Co., Hoosick Falls, N. Y. It dealt with "Cupola Practice,—Melting and Controlling Mixtures of Iron." More than an hour was taken up in the reading of the paper, and following it came a discussion that demonstrated how vital are the questions involved, in the mind of the average foundryman. The division of the subject relating to the control of mixtures brought out most discussion. Prominence was given in the expressions to the influence of sulphur, and silicon, ordinarily

the element that comes to the front in discussions on the metalloids, was, for this occasion, in the background. The judgments on Mr. Beckett's effort were highly commendatory, inasmuch as he went straight to the points about which the man engaged in every-day practice wants most to know and to talk.

THIRD DAY.

There was an evident purpose in the mind of President Schumann to pack as much of paper-reading and discussion as possible into the first session of Wednesday, and three of the regularly scheduled papers were heard and commented on, so far as the association cared to discuss them, before the noon adjournment.

Chemistry in the Foundry.

S. S. Knight, chemist of the Addyston Pipe & Steel Co., Cincinnati, was heartily applauded at the conclusion of his practical and suggestive paper on "The Value of Chemistry in the Foundry." It will appear in full in these columns next week.

Mr. Viall, of the Brown & Sharpe Mfg. Co., said that this company had never equipped a laboratory, but had employed a chemist, and its expectation was to fit up a laboratory soon. He was thoroughly in sympathy with the position taken by the paper.

Mr. West: There is still a reform to be worked out in the methods of the blast furnace, in the employment of chemistry, before foundry chemistry will advance as it should. We wanted a 2 per cent silicon iron in our practice. Our chemist found that the iron sent us to fill that requirement contained only 1.50 per cent in silicon. The furnace said that a few pigs had probably got into the wrong pile. We replied that the wrong pile had evidently got into a half dozen shipments. It is very easy, when a furnace wants to get high silicon iron, which is more expensive, to make analyses of the last part of the cast and make that answer for all. Furnacemen should take samples from different parts of the cast. Then we found a case in which the man whose duty was to work the piles in the furnace yard had marked them wrong. Our experiences have impressed us with the necessity of greater care by the furnaces.

Making Crucibles and How They Should be Cared For.

The second paper was by John Walker, vice-president and treasurer of the Joseph Dixon Crucible Co., Jersey City, N. J., on "Making Crucibles and How they Should be Cared For." Mr. Walker has been connected with the manufacture of plumbago products for nearly 35 years and his paper, which will be printed in a later issue, was received as an autl.oritative utterance on the subject. In the discussion of the paper, Mr. Metcalf, of the Frank-Neeland Machine Co., told of his experience in annealing the stoppers used in connection with the casting of open-hearth ingots, when he was engaged in steel manufacture. These stoppers were of the same composition as the crucibles described in the paper, and there had been some trouble with frequent breaking. The practice adopted was to put the stoppers in the furnace at night under a low heat, gradually increasing the heat until next day it was brought up to the melting point of steel. Then all draft was shut off and the stoppers allowed to remain a sufficient time. It was found that any stopper standing this process would not break in casting ingots.

Mr. Williams, of Cleveland, had been accustomed to anneal crucibles in core ovens. He had got 35 heats from good graphite crucibles thus annealed. Care was taken to keep the crucibles free from dampness. The results had been quite satisfactory.

"Chilled Iron and Chilling Iron,"

Was the title of the paper read by E. H. Putnam, of the Chattanooga Chilled Plow Co., Chattanooga. It is given substantially in full in another column.

In the discussion Mr. Ferguson referred to an experience of 15 years with work requiring to be chilled variously from ¼ inch to 5 inches. One question that he had never known to be satisfactorily answered, either with or without the help of chemistry, was, "What makes iron chill?" One answer is that it is combined carbon. "While I am satisfied," said the speaker, "that combined carbon cuts quite a figure, I believe all the elements have their share in making the change. There is a hard chill and a soft chill. I had a 1½-inch chill on a casting analyzed and it showed 1.53 per cent of combined carbon. A similar iron, with the same depth of chill and to all appearances identical, showed combined carbon 0.60 per cent. Other elements contributed to the result."

Mr. West: Chilled iron involves more complications and more chemical considerations than any other class of iron. One question that comes up in this connection is this: Does hard iron or soft iron melt sooner? I say the former. Mr. Knight takes the opposite position. There are many authorities who say that hard iron melts the quicker, and that is my experience. We can make hard iron by having low silicon, or by high sulphur. As a general thing, higher sulphur is the cause. I think an investigation as to the relative percentages of the metalloids would solve the question. As to chilling and non-chilling irons: Coke irons range higher in silicon; the higher this element the less the chilling quality of the iron.

Mr. Sadlier, Springfield, O., referred to the experience at Braddock with direct metal hauled 1½ miles from the furnace. The analysis made at the furnace would not hold good at the converter. It was the speaker's idea that a puddling furnace action was going on in the molten metal—the burning out of the graphite. Gas quickly confined in iron causes the chill—the quick chilling of a ladle full of metal cause the retention of the gases that are taken up by the iron in the cupola.

Mr. Metcalf: My theory is that when iron is melted, all the elements in the bath are in chemical combination. If there could be a sudden and complete chill, we would get white iron. In the iron that is immediately in contact with a chill, the carbon is held in chemical combination; in the part not in contact with the chill, the carbon exists as a mechanical mixture. In taking drillings from pig iron, to make analyses, you will find less carbon in the coarse turnings than in the fine drillings, since in the latter will be found also the graphitic carbon that was held in the pig in mechanical mixture. As to the question whether hard or soft iron melts at the lower temperature: Wrought iron, we know, requires a higher temperature to melt it than cast iron or steel. I have seen the experiment tried of applying heat to pig iron, soft cast iron, white iron and steel. The steel required 3,000 degrees and melted last. The pig iron melted first, the soft cast iron next, and the white iron next.

Mr. Lanigan, of Lawrence, Mass., referred to his experience in making shafting from a mixture that contained a percentage of old car wheels. He asked Mr. Metcalf why the chilled part of the casting was always on top. Mr. Metcalf replied that the heat of the metal, after pouring, was carried off rapidly. The top part of the casting being exposed to the air received the chill, as its heat was carried off quickly. The lower part being confined in the sand, there was less rapid radiation.

President Schumann called attention to the application to the phenomenon of chilling, of the laws of physics pertaining to dissipation of heat. The rapidity with which heat is dissipated gives you the ratio of hardness. Some irons combine the carbon more readily by the rapid loss of heat. A chill is intensified hardness. Metallurgists are not able to determine what physical property of iron causes greater or less chilling. There are not only two, but three or four forms of carbon, and the varying conditions of the carbon must be followed up to get the key to these phenomena. Experiments in this direction are now being conducted by German investigators.

Commenting on what Mr. West had said as to the sudden chilling of iron by immersion in water, Mr. Frank said it was necessary, in studying the phenomena of chilling, and the question of relative fusing temperatures of various kinds of iron to know their chemical constituency. Hard iron may be produced by very high silicon, by low carbon, by high sulphur. A high sulphur iron, it is true, melts at a lower temperature than gray iron, but low carbon iron melts at a higher temperature than gray iron. It is necessary to know what makes your iron hard.

Martin Fox on an Eight-Hour Day.

The afternoon session of Wednesday brought a diversion from technical discussion and a return to the economic questions which were raised in the address of President Schumann. Mr. Pfahler, of Philadelphia, took the floor and paved the way for what was to come. He said that above questions of practice, in present interest, was one that was met with every day and that had a direct bearing on the pros-

prerity of the foundry interest, namely, that of a reduction in the hours of labor. The speaker said he had not met a manufacturer in two years who was not in favor of a reduction in the hours of labor. Without further preliminary he introduced to the convention Martin Fox, president of the International Iron Molders' Union, who was warmly received. Mr. Fox read an address of over half an hour, in which he went over the arguments for an eight-hour day, answered objections, and in conciliatory and well-put words made a strong case for the shorter day. He granted that the change could not take place without a corresponding reduction in wages, though if there were the possibility of enforcing the new regulation simultaneously all over the country he would say that wages should remain as at present. The evils of the present plan of spasmodic operation of works; the crowding of a year's product into a few months, in some cases; the large number of unemployed men, able and willing to work, who would get places if the work day were shortened; the increased efficiency of labor, under shorter hours (though, with his knowledge of the physical strain already upon the molder, he did not lay great stress upon this argument, as applied to that employment); the enormous increase in the effectiveness and productivity of labor in this age of machinery, forcing upon us the problem of overproduction, because no reduction has been made in working hours—these and other considerations were urged by the speaker in a clear and logical way that made a good impression upon the convention.

Mr. Fox's address and the question opened up by it were referred, on motion, to the committee on defense association.

Notes on Pipe Founding.

An interesting paper of the afternoon session was that of S. Groves, of Pittsburg, on "Pipe Founding." The speaker had had 21 years' experience in the manufacture of vertical pipes in one of the largest foundries in the world, and some of the fruit of that experience he gave the convention in a three-quarter-hour address. Blackboard sketches were employed to illustrate the descriptions. With 600,0000 tons of pig iron consumed each year in the pipe foundries of the United States, and $10,000,000 worth of product turned out, the speaker intimated that this industry was more important than its scant literature would indicate. In the pipe foundries of Europe socket and spigot pipes are cast with the socket downward; in this country the practice is the reverse. The speaker emphasized the necessity of having metal close and solid at the socket of the pipe, defects here furnishing the most frequent causes of rejection. The gradual increase in the thickness of the section, coming to the socket, is a method of securing strength and perfection. In passing he noted that if the engineer and the draftsman, in preparing plans, looked more to the equalization of section, there would be far less trouble with castings in the foundry.

Pipe of 1 inch to 2½ inches diameter are cast on banks at an angle of 30 degrees. A cast iron core bar is used. Pipe from 3 inches up are cast in oval pits, these being arranged in series over a foundry 250 to 300 feet long. In an oval pit with flasks fixed in the pit walls it is possible to cast 80 3-inch pipes 9 feet long in a day. A new method of equalizing blacking on the mold was explained—a receptacle for the wash being provided, with a spring and valve, discharging the wash evenly. The old-fashioned way of drying molds, by which the fumes from the fire escaped into the shop, was referred to. A better way is to utilize the heat generated in gas producers outside the foundry, a blower being employed to send it to the pipe pits.

With some detail the method of making pipe cores was explained, both for large and small pipe. The drying of the covers was accomplished by the use of gas from the gas producers already referred to.

Mention was made of one foundry which utilized metal run directly into ladles from the blast furnace. High phosphorus iron is just the thing for pipe, the phosphorus being an excellent preventive of oxidation. An ingeniously constructed ladle was illustrated, having a partition running down nearly to the bottom, thus keeping out the scoria and always furnishing clean metal.

Tests are made by applying a hydraulic pressure of 300 lbs. per square inch. At a Chattanooga pipe foundry the testing apparatus is operated by hydraulic power. This was referred to recently in a description of the plant, as a new feature; but the same plan is followed at R. D. Wood & Co.'s foundry.

The danger of striking pipe with an iron hammer while it is under hydrostatic pressure was referred to. An instance was cited in which a wrought iron ball weighing 1½ lbs. was let drop, from various heights, upon pipe which was under water pressure. On examining the test pipe afterward a star-shaped fracture was found inside, at the point where the ball had struck.

The protecting coat of cold pitch varnish is given the pipes last of all. Cast pipe have an advantage here, since no cement or varnish has been found that will remain on built pipes of steel or wrought iron plates.

In concluding the speaker referred to the close requirements as to transverse strength and deflection. It is said that one-third of the cast iron pipe made is rejected by inspectors. The phenomenally low prices at which pipe is sold should not be taken as an indication that little skill is required in their manufacture. The reverse is the case.

Revision of the Constitution.

The report of the committee on revision of the constitution, consisting of G. H. Carver, West Pullman, Ill.; W. H. Carpenter, Providence, R. I., and Wm. Yagle, Pittsburg, came up next. The committee had spent much time on the suggestion that the American Foundrymen's Association change its basis to that of a federation of the various sectional and local associations of foundrymen. This plan would make the annual convention a delegate gathering of so many representatives from the Philadelphia association, the Western Foundrymen's Association, the Pittsburg association, the New England association, and so on. It was decided, however, that no change from the present plan should be made. Direct membership by individual firms will therefore continue.

While in the midst of the discussion of proposed amendments, at the Wednesday afternoon session, the association got into a parliamentary tangle, in the midst of which an adjournment was taken.

Wednesday evening's reception in Harmonie Hall was a delightful function, which the members enjoyed to the utmost. A programme of music and readings was given and refreshments were served.

FOURTH DAY.

The final session, Thursday morning, finished the reading of papers and the transaction of business. G. A. True, of the Whiting Foundry Equipment Co., gave a paper on "Foundry Elevators and Yard Cranes," which was well received. It appears elsewhere. J. F. Lewis, of the Rand Drill Co.'s Chicago office, read a paper on "Compressed Air," which excited no little interest and comment. Owing to the shortness of time, the paper of F. J. Davis, of the Cowles Electric Smelting & Aluminum Co., Lockport, N. Y., on "The Value and Use of Aluminum, Manganese and Silicon in Brass Founding," was read by title.

The constitutional amendments as reported from the revision committee were then taken up and adopted. One provides that persons and firms may become active members, on approval of the executive board without waiting for the annual meeting. Another does away with an initiation fee and makes the annual dues $10, in semi-annual payments in advance. Where a person or firm shows membership in a local association, its dues in the American Foundrymen's Association are reduced to $5 a year.

The committee of seven on defense association reported that it had secured the signatures of a number of foundrymen who agreed to take preliminary steps, at least, toward such an organization. The committee was continued for another year with instructions to communicate its plan to the membership, meanwhile, by letter. Geo. H. Gibby, of Boston, was substituted on the committee for J. F. Lanigan, the latter asking to be relieved.

Officers for Next Year.

The election of officers resulted in the choice of the following, on recommendation of the nominating committee, which reported through its chairman, John R. Russel: President, Francis Schumann, Philadelphia; secretary, John A. Penton, Detroit; treasurer, Howard Evans, Philadelphia. Vice-presidents: New England States—W. E. Sessions, Sessions Foundry Co., Bristol, Conn.; Middle States—I. W. Frank, Frank-Kneeland Machine Co., Pittsburg; Southern States—E. H. Putnam, Chattanooga Chilled Plow Co., Chattanooga; Central States—C. S. Bell, Hillsboro, O.; Northwestern States—C. J. Wolff, L. Wolff Mfg. Co., Chicago; Southwestern States—W. S. Mosher, Mosher Mfg. Co., Dallas, Tex.; Pacific States—Irving M. Scott, Union Iron Works, San Francisco.

After speeches by the officers-elect the convention adjourned *sine die*.

CHILLED IRON AND CHILLING IRON.*

BY E. H. PUTNAM.

Chilled iron is iron that has been cast in a mold constructed, partly at least, of iron, one effect of which is to solidify the casting to a greater or less depth so quickly as to prevent separation of the carbon from the iron. The elements in such iron are chemically combined with it (though in non-chilling iron it is impossible to hold the carbon in combination) for producing an approximately uniform and close grain of texture and of white fracture. On the other hand iron of the same grade or mixture cast without chilling presents a gray fracture and is comparatively coarse and rough in texture, because the carbon during the slow process of cooling has become separated from the iron and lies in flakes within the mass between the iron crystals.

Chilled iron, or iron with its impurities held in combination by the mechanical means of chilling, is of much less transverse strength than the cellular gray iron, but its crushing resistance is vastly greater. Again, chilled iron, or iron whose carbon has been fastened in the combined state by chilling, is much stronger than iron whose carbon is combined in the pig. The grain of the fracture in chilled iron is very different from that in all other irons. Common white iron has a very irregular grain and much the same may be said of gray iron. But chilled iron of the highest class presents a beautiful fracture whose close-lying crystals of uniform shape and dimensions, fine and, to the practiced eye, satisfactory, are the happy response to intelligent effort and evince man's power over the things of nature.

I said the cellular gray iron is coarse and rough. This is because of the uneven texture of the mass, the iron portion being a sort of honeycomb framework, whose cells are filled with graphitic carbon. The iron is hard and rigid, but the graphite is soft and flows almost like water under pressure of the fingers. Therefore, the chilled iron is immeasurably better for the purpose of crushing anything; as grain, in the manufacture of flour, or of reducing rocks for various mechanical uses, such as making rubble for roadways, or of stamping ores. The gray iron being cellular and soft, would speedily wear out, becoming rough and therefore useless in a very short time; while the chilled roll, having a uniform texture of extreme hardness, would wear very slowly, and, more important still, very evenly throughout the whole area of surface. Another feature of the chilled roll which renders it available where mere white, hard iron is out of the question, is the fact that it is hard and non-cellular only where such qualities are desirable, while the remainder of its mass is a very fine cellular structure, conducive to the greatest possible transverse strength, yet easily susceptible of tooling, thus rendering it, we might say, perfect for the uses to which it is put.

Chilled plow foundrymen 40 years ago realized but very little indeed of the splendid achievements that were yet to be made in that line of industry. Any kind of iron would answer, the principal question being, is it cast on a chill? Indeed, it was almost a matter of indifference with most plow makers as to whether the chill were used or not. Still, there was nothing strange in this. The great things of this world are not each the fruit of the labor of an individual, but they are the crystallized product of the protracted efforts of many. And so the chilled plow has attained its present state of approximate perfection only within the last 20 years.

Chemistry and Chilled Iron.

I find that chemists generally insist upon the imperative need of their peculiar skill in conjunction with that of the founder, and I am not at all sure but that chemical analysis could be employed in most foundries to advantage, from a money-making standpoint. But I am content to leave the advocacy of this system to such as can handle it better than I. Pardon me, however, if I state that I think the more appropriate place for the chemist is at the smelting furnace, where the iron is produced, and that all iron should be analyzed and the character guaranteed. The smelting furnace generally falls very far short of what it must yet attain in the matter of accommodating its customers.

*Read at the Annual Convention of the American Foundrymen's Association, Detroit, May 10-13, 1897.

Chilled iron has certain physical characteristics that indicate excellence in qualtiy, and these are the only guide of most foundrymen in the conduct of their business. It would be impossible to describe these in such a way as to convey an intelligible idea to the novice in chilled iron; yet they may, I think, be so described that he who follows the business and watches it closely, comparing results with this description, will know when he is producing good or bad iron, for it is quite possible to produce very bad results with the very best of iron.

The desideratum is a fine grained, solid, strong and very hard iron. Some irons or mixtures of irons produce a very coarse crystal, and are therefore intolerable, because weak, if nothing else. When this occurs simply change the proportions of the various irons in the mixture as indicated till the fine crystal and the normal strength appear. Chilled iron, sometimes like gray iron, has small cavities which are, of course, in the last degree objectionable. You frequently see these cavities in the pig. Remelt this pig with a per cent of scrap and pour it into castings and the tendency to show cavities will be diminished. But take this pig iron and say, two other brands of pig, and mix them with a proper per cent (say 50 per cent) of scrap and the cavities will probably disappear. It is the same old fact that iron is improved by remelting to a limited extent.

Mr. Keep says some low silicon charcoal iron has no chill. Hardness is inherent in true chilling iron well chilled, and the normal strength results from following the above rules, provided you gauge properly the chilling tendency of the mixture.

It is desirable to chill some castings clear through, so that a fracture through any section will be entirely white, while in other castings the depth of chill should be but a fraction of the whole diameter. But we shall do well always to bear in mind that white iron or iron in which the carbon is all combined is, as to transverse resistance, weak, though the same iron poured into a sand mold and not chilled might be of the very strongest. It is, then, obvious that the tendency to chill should be no greater than the work in hand demands, in order to the highest possible strength.

Let me make sure of being understood about this. If the only desideratum were that the tendency to chill should be sufficient, then the making of a chill mixture would be one of the simplest of matters. But, in fact, any considerable excess of chill tendency detracts from the qualtiy of the casting, because, while it gives nothing desirable, it diminishes the strength. The permissible latitude is, however, sufficient for all practical purposes. That is, a skillful ordering of th mixture will insure sufficient chill without sacrifice of strength. And, on the choice of irons for this mixture, largely depends the amount of profit, for there are several dollars difference per ton between two first-class chilling mixtures.

Difficulties in Chilled Work.

Many people find it difficult to make clean chilled work. This arises partly from the fact that iron, so hot as this should be melted and cast, will cut and disturb the sand more than the less heated soft iron. For, though white iron may fuse at a lower temperature than gray iron, it certainly requires a much higher temperature to make it sufficiently fluid for casting.

Pardon me if I dwell for a moment upon this point. I cannot but think that a great many foundrymen have had very disheartening experience in the manipulation of white iron and chilled iron, just because they have heard or read somewhere or perhaps everywhere that iron high in combined carbon melts at a lower temperature than soft gray iron. In the light of my own experience, I wish that every man who asserts that hard iron fuses at a lower temperature than gray iron would at the same time explain that because of being less fluid, it must have much higher heat in order to successful casting. But does chill iron really fuse at a lower degree than soft gray iron? I see that some recent writers deny it; and I am glad of it! I hope, in the name of consistency, that the denial will be sustained; for it is a seeming paradox to say that hard iron fuses at a lower degree than gray iron, while you know that in order to cast successfully your hard iron you must use much more coke than with gray iron. But this is a question for the chemists to settle and I am content to leave it with them. Though I must give them this parting

shot, that is, however, much less heat it may take to melt hard iron, it certainly requires a great deal more heat before it can be cast.

Extraordinary precautions should be taken against dirt in chilled iron. As foundrymen generally know, the surface iron in the process of filling a mold does not flow, but chills and clings to the mold surfaces or walls, while the iron on the upper surface, if undisturbed, unfolds itself against the side walls, carrying with it and holding whatever of foreign substance may be present. Of course, this same process takes place in casting in gray iron. But as my work for many years past has been largely in chilled iron I have been compelled to give much more attention to cleanliness than would otherwise have been the case. And I think I may claim to have fought a winning fight against dirt in iron.

And in the hope of helping some one a little, I will say that if you give the dirt a good chance it will keep out of the mold by virtue of its own character. The dirt is very much lighter than iron and therefore if you provide sufficient room in the system of gates for the dirt to dodge above the inflowing current, and behind some obstruction, it will invariably do so. The down-gate itself is an excellent skimmer if sufficiently large and if kept filled to a point above the surface of the runner. In rolls the pop-gate is often most desirable, as it keeps the surface of the iron constantly agitated and so prevents the dross from clinging to the mold walls, whether these be of sand or of iron. But, above all things, never stop short of success in making clean castings. And now,

What is Chilling Iron?

It may be thought that this is a very simple question, easy to answer. But I answered the question, as I thought, some time ago, in the foundry department of the *Tradesman*, and next thing I knew somebody said (also in print) that I didn't know what I was talking about. I don't like to be too positive of my knowledge of a thing, for I realize that I might possibly be mistaken. I have been manipulating chilled iron only for about 15 years, and so haven't had time to learn it all. But, to give you an idea of what I don't know about it, I will say for many years I was in the habit of melting daily in one cupola, at one heat, from three to five distinct grades or mixtures of irons; from two to four of these mixtures being chill mixtures and one of them being required to be so exact in chill tendency as to give the required chill from mere contact with the sand—on iron chill being used for this particular mixture. One of the mixtures was for soft gray iron, and during all of this time I never knew what I thought to be a non-chilling mixture to chill, save on a few occasions. The No. 2 charcoal iron on these occasions proved to be of that anomalous character wherein the fracture does not tell the truth. Then, during another period of years, I made three mixtures to a heat daily, using many different brands of both charcoal and coke iron, and yet I never learned from experience that anything but charcoal iron was a good chilling iron. Of course, I am well aware that coke iron may be used very largely in the chilling mixture, but I believe that if you produce good results the chilling tendency will be given by something else than coke iron. My experience in handling chilled iron has been had in three different foundries, and in one of these at least I was enabled to experiment to my heart's content. I made very radical variations in per cent of charcoal and coke irons and, in fact, I produced chilled castings from coke iron alone. After this it may sound paradoxical for me to say that I do not regard coke iron as a chilling iron, and yet that is just what I say. To produce chill in coke iron the pig used must be so high in combined carbon as to render the casting product extremely weak.

The tendency to chill is, in coke iron, generally very slight. On the other hand, the chilling tendency in the various numbers of charcoal iron of approved brands is great and approximately constant. So that the operator can make a mixture of charcoal and coke irons that will produce any desired result.

Mr. Keep in his "Cast Iron Notes," in the *Foundry*, says (November, 1896, p. 124): "Lately it has been found that non-chilling coke iron can be used for car wheels by using portions of malleable scrap, which impart a chill. The chill in such cases is largely obtained, however, by the use of old car wheels." Again, in the *Foundry*, p. 93, November, 1895, Mr. Keep says: "Some charcoal pig iron will not produce a chill, and some coke iron will. It is not a question of chemical analysis. Some irons that are chilling will show the same analysis as others that are not chilling." If the latter is true, the former must be true also. I must say, however, that in about 15 years of constant practice in the manipulation of chilled iron mixtures, though I have sometimes found a charcoal iron that disappointed me in some measure in not chilling so deeply as I had expected, and though an occasional car load of coke iron had show an abnormal tendency to chill, yet the line of demarcation between the two has, as a rule, demonstrated the chilling tendency of charcoal iron and quiet as distinctly the non-chilling quality of coke iron.

Of course charcoal iron is far more costly than coke iron. Fortunately, however, the chilling tendency of some charcoal iron is so excessive that a large per cent of non-chilling iron may be used in the mixture, which will still have sufficient depth of chill. Charcoal iron alone was formerly used in chilling mixtures. But in recent years coke irons have been much employed as the factor for reducing chill tendency. In my opinion, nothing has been lost by this change, for you still depend upon the charcoal factor for the chilling quality.

I do not know of any reason why coke iron should not possess the same chill tendency as charcoal iron. I only know that in general it does not I would not be a matter of surprise, however, if chemistry should in the near future solve this problem for us. It is certain that if any man could to-day produce a chilling coke without extra cost the equal of the charcoal product he would not have to keep the secret of his process long to make him the richest man in the world, for the difference between $7 per ton and $14 per ton leaves room for a very comfortable profit.

Concerning Testing.

With regard to chemical analysis and physical test, I do not doubt the value of either.. But the great majority of our founders cannot, or at least think they cannot, afford chemistry. Whether they are right or wrong, the fact remains that the adoption of chemical analysis will be a slow process. I do not know whether anybody else in the world makes a chilling test of the molten iron before casting it. But I always do and by this means I am enabled to make an approximately uniform grade of chilled castings throughout the heat and throughout the year. My cupola ladle is large enough to hold a whole charge of iron and I melt it so hot that after tapping out it may stand for several minutes and still be amply hot and fluid enough for casting perfectly. We tap into this ladle and when about three-quarters full a test casting is made upon a chill. This casting, perhaps three-quarters of an inch deep by one inch wide by four inches long, will solidify in less than a minute. It is then immediately plunged into a bucket of cold water, and as soon as it turns black it is broken and the depth of chill appears. If just right the iron is at once poured into the molds; if a little too hard or too soft, more iron is tapped into the ladle and another test taken. Thus we know that every casting we make is just what we wish it to be.

The molding for these tests is done thus: The flask consists simply of a cope part, perhaps three and a half by six and a half inches by two inches deep. The pattern, three-quarters of an inch deep by one inch wide by four inches long, is cast solidly on a cast iron plate, whose length and breadth corresponds with that of the flask. The down-gate, of conical shape, is also solidly cast on top of one end of the pattern. The flask is three-quarters of an inch thick, so as to make it heavy, thus obviating the need of weights in casting. Now, a pile of sand is riddled and the flask is set upon the pattern plate; a double handful of sand is thrown in with force, a couple of strokes of the hand ram, strike and expose the top end of the pop gate. The draft of the latter and of the pattern are so sharp that the cope is quickly lifted therefrom, and set down in position upon a long, planed and oiled cast iron plate or chill. Enough molds can be made and placed upon this chill for the day's use in a few minutes. The tests, after examination, should be placed in regular order upon a shelf, so that next day before making up the mixture for the charges those tests may be closely scrutinized and any variations needed may be made in the mixture. Of course, we make test bars also, every day, and their transverse strength, deflection and especially the character of the crystallization, furnish a constant and efficient guide, which, together with the known excellence of the irons used, leave little to be desired.

FOUNDRY ELEVATORS AND YARD CRANES.*

BY G. A. TRUE.

The foundry is about the last branch of iron manufacturing business to widely introduce mechanically operating machinery. The naturally conservative spirit of the foundryman has been fostered in the past by the tendency in large plants to buy the latest machinery for the machine shop and the erecting shop, but to let the foundry (often the best paying branch of the business) get along with what it always has worked with. During the last decade, this spirit, or lack of spirit, has largely disappeared, and all new plants, as well as many old ones, have utilized the most improved power-operated appliances obtainable. This has been true especially in the foundry proper. The molder has been given improved cranes, ladles and molding machines. But there are still some ragged edges. The yard, however, is often sadly neglected, and there the management often satisfies its philanthropic energies by the employment of a large laboring force under the excuse that "a lot of men have to be kept around, anyway." Considering the amount of material handled, in the average foundry yard and the expenditure of power in hoisting the stock to the charging floor, it would seem that here is one portion of the plant that should receive more consideration.

The elevator portion of this paper will probably not interest those fortunate foundrymen who have located their plant on a hillside and for whom an obliging switch engine gently elevates their iron in car load lots to stockyards level with the charging floor. This is an excellent scheme from the manufacturers' standpoint, but the foundry Mahomet cannot always go to the mountain; so it often happens that the crane builder or the elevator builder must come to the foundry. It is probable also that the foundry of small proportions will be less concerned in the subject than it should be. The scaffold of such foundries is often, too often, reached by leg power and profanity, rather than by mechanical power and profit.

The old style inclined plane for wheelbarrows seems to have declined to some extent, except in antique plants, and in its place the vertical "lift" has for several years held undisputed sway. These machines are of too general use to warrant a detailed description—usually some simple form of warehouse or freight elevator operated by belt or electric or hydraulic power. Of late years the non-freezing qualities of compressed air have largely superseded hydraulic power for the reason that the foundry hoist is almost invariably in a semi-exposed location and the climate is against hydraulics several months in the year. This is probably one reason for the failure of Americans to more generally adopt the simple hydraulic plunger hoists so commonly used abroad.

The ordinary worm or spur geared elevator is familiar to all foundrymen. It should be about twice as heavy throughout as the ordinary "warehouse" or freight elevator of the same rated capacity, for it is generally handled by laborers and is subjected to very rough handling. The spur geared elevator is more efficient than the worm geared machine, especially when used for heavy loads; it is more expensive, too, in first cost. The usual capacities are from one to three tons, with lifts of from 12 to 20 feet. An automatic top and bottom stop is usually provided, and in some cases the platforms have automatic safety dogs, although the short lift often renders these inoperative. The electric elevators are modifications of the belt power machine, the motors being sometimes direct connected and often belt connected. The steam engine types are usually direct connected and reversible. The air motor types are of similar construction and are of comparatively recent design. The more familiar type of compressed air elevator is an application of the common air cylinder hoist lifting the platform by a wire rope, either simple or compounded, passing over sheaves. This is sometimes modified by introducing the cylinder directly below the platform "plunger fashion." In some localities a hydropneumatic or a steam hydraulic combination can be used to an advantage; the water or other incompressible fluid being used over again and again. If water is used, it should be mixed with an anti-freezing compound if in an exposed location, or in some cases oil can be used, although the proximity of the hoist to the fire of the cupola makes this generally undesirable. In some cases a jib crane has been adopted to perform the work of an air elevator and to also cover other service. In the paper on "Cranes," read last year by Mr. Outerbridge, before this association, a device of this type was described. This crane was supported by a central pillar and had a radius of 30 feet, effectively covering about 2,500 square feet of yard service, in which the pig iron was stored. There are in St. Louis in the works of the Harrison-Howard Iron Co., and Missouri Car & Foundry Co., yard cranes doing similar work. The pig iron is loaded on special cars, which are hoisted and swung to the platform by steam or electric power, the trucks being then wheeled to the cupola.

In the works of the Whiting Foundry Equipment Co., at Harvey, Ill., the iron and fuel is hoisted and carried to the charging floor by means of a conveyor track and trolley running from the cupola across a portion of the stockyards, and over the railroad track, from which the stock is unloaded. The track and hoist is of two tons capacity, and both the trolleytravel and lifting motion are operated by compressed air. The height of lift is about 25 feet, and the length of trolley travel over the yard is about 50 feet, with an additional travel in the charging house of about 25 feet. The iron is loaded on trays carried by trucks in the pig iron yard and is moved under the conveyor, which lifts the trays to the charging floor, where they are either deposited on trucks or carried by the conveyor to the cupola.

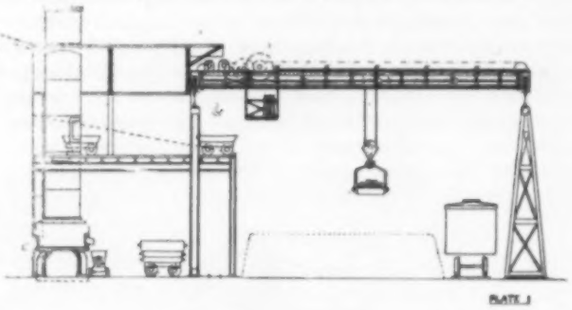


PLATE 1

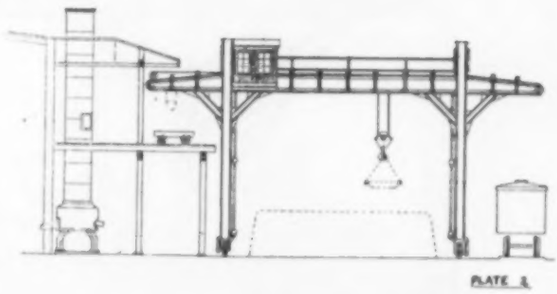


PLATE 2

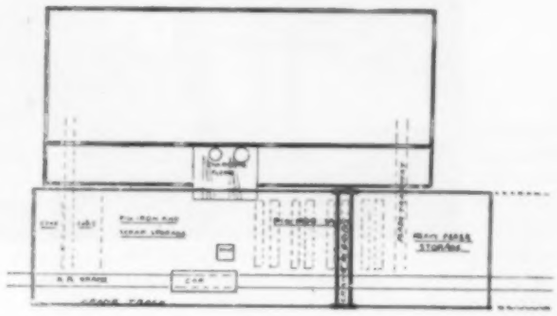


PLATE 3

FOUNDRY ELEVATORS AND YARD CRANES.

This device is in an uncompleted form as yet, the original plan contemplating the extension of the trolley track or bridge another 50 feet or more, and the storage of the pig iron in piles, at right angles to and convenient to the line of trolley travel. But in its uncompleted form it has demonstrated its usefulness and versatility. It plays various roles besides that of a charging floor elevator; it serves as an ex-

*Read at the Detroit convention of the American Foundrymen's Association, May 10-13, 1897.

cellent casting breaker or "drop," and it has on numerous occasions demonstrated its value as a loading crane where there was a run of duplicate work within its capacity. Could its range of usefulness have been foreseen when it was planned, the lifting capacity would have been greater and provisions would have been made for its use as a loading and unloading crane for all work up to five tons weight. A similar system operated by belt power was installed in the foundry of Thomas & Son, of Newark, O., several years ago and is still in service.

The ultimate efficiency of such a device and its maximum form of usefulness in serving yard and charging floor is probably embodied in a continuation of the scheme of which this is a practical beginning, and that is, the adoption of an overhead traveling power crane or traveling gantry to serve the entire yard; spanning the outside tracks, hoisting the pig iron and fuel to the charging floor, doing service as a drop hoister, a loader of moderate weight castings, and a flask crane, and in many plants a crane to unload and distribute the pig iron. Not all foundries have a capacity to warrant the investment, and still fewer have their yards so arranged that such a crane could be used advantageously, but the suggestion is presented for the consideration of those who may contemplate future plants, or whose yards are so arranged that such a scheme can be employed.

The application of a traveling crane for this service, running on elevated tracks, is illustrated in cut No. 1, and the adaption of a traveling gantry on surface tracks to work of this kind is shown in cut No. 2; while an outline plan of the system, applied to the foundry yards above referred to, is shown in cut No. 3. The method of transferring the flasks from the yard crane to the shop, on surface tracks, is indicated, as well as a proposed plan for transferring the castings from shop to the yard crane. The half-tone cut shows a gantry recently installed in the plant of Dennis Long & Co., of Louisville, serving the flask yard, with one overhanging arm which may be applied to the charging floor service. The gantry shown is of five tons capacity, the length of girder is 42 feet, the gantry travel being over 300 feet. It is operated by three independent compressed air engines, and is at present serving a flask yard only. Electricity or any other convenient power could, of course, have been successfully used. The speed for the service under discussion should be high, hoisting light loads to the charging floor at the rate of 60 or 80 feet per minute and traveling on the tracks 150 to 300 feet per minute.

The advantage of a traveling device over a swinging crane in such service is apparent. The additional ground covered, the ease of covering more area by extending tracks, and its usefullness in handling flasks, as well as loading and unloading in any part of the yard, are considerations which fully justify the increased first cost. The modern pipe foundry yard especially offers a ripe field for such a machine.

The flask yard has long been a much neglected corner of the foundry plant. A few modern and enterprising firms have installed locomotive cranes in this service with good results, although sometimes at a sacrifice of valuable room for tracks. Russel & Co., Detroit, and the Gates Iron Works, Chicago, have locomotive cranes. Many use no crane at all and a labor statement taken in some large plants showing the annual cost of handling heavy flasks by muscle would be interesting. Others have a hand power jib crane serving a limited area and necessitating the stacking of flask on flask, involving the interesting and deliberate operation of frequently removing six top flasks to get at the bottom one. An overhead yard crane of high speed and ample capacity can, in the average plant, be made to serve the flask yard as well as the cupola, and have plenty of time left to do duty as an unloader of pig iron and fuel, and a drop hoister or breaker.

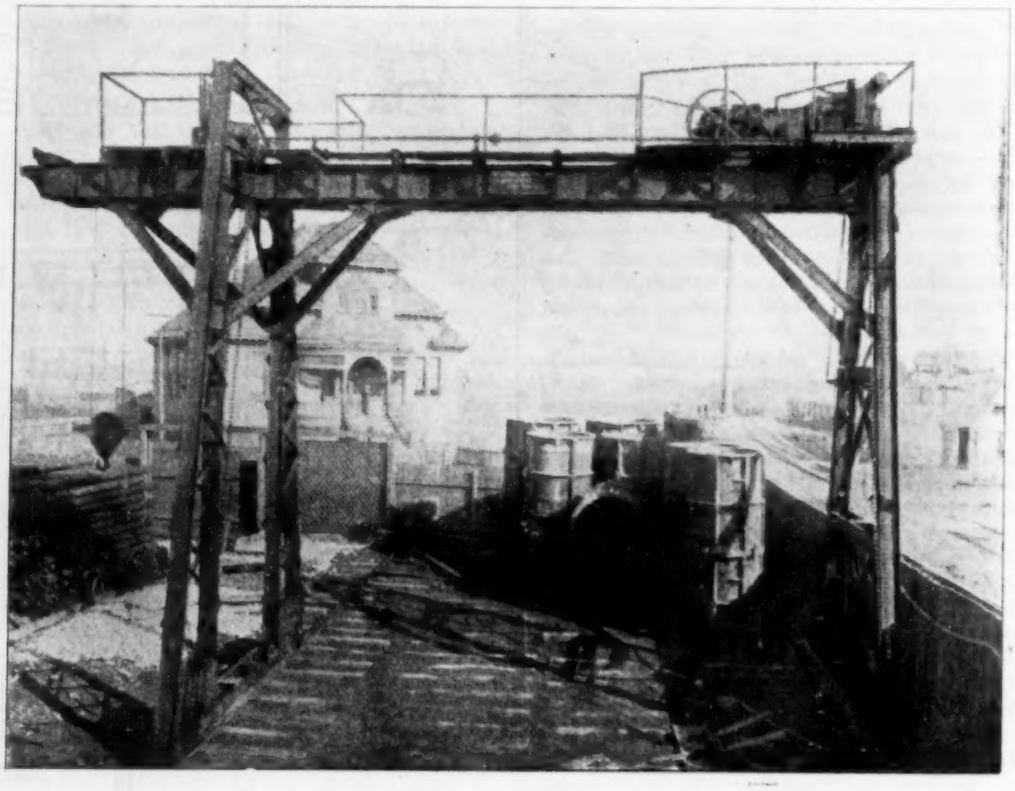


PLATE 4.—FOUNDRY ELEVATORS AND YARD CRANES.

In order to allow such a crane to work to its best advantage, provision for some storage on the charging floor should be made, and a multiple system of pig iron trays, or trucks, and coke buckets, should be used, thus avoiding in a measure the delay at the loading and unloading points. Under such a system no difficulty should be experienced in handling from yard to cupola floor 20 to 30 tons of iron and coke per hour; and a greater amount hourly from cars to pig iron yard. The use of an auxiliary dumping device facilitates the handling of iron from the cars, and by moving the cars to a point opposite the place where the pig iron is to be stored, the trolley travel and hoist alone need be used when engaged in this branch of service.

The suggestion of the paper, in summary, would cover the recommendation of one or more high speed traveling cranes, or gantrys for outdoor as well as indoor service in all foundries of large capacity. This necessarily involves the planning of modern plants with a view to utilizing such a crane in as great a variety of ways as possible. Undoubtedly in many large plants two such cranes operating on one track would find ample employment at a good return on the investment.

HANDLING OF BLAST-FURNACE MATERIAL.—III*

(Concluded.)

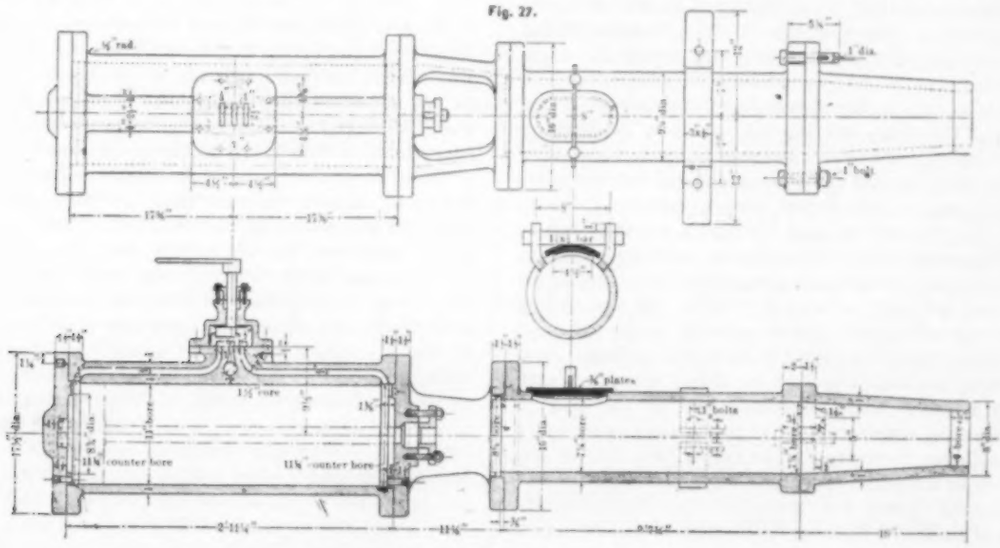
BY AXEL SAHLIN, SPARROWS POINT, MD.

As improvements in the method of dealing with the iron, two auxiliary machines for opening and closing the tap-hole deserve special mention.

The tap-hole drill, a pneumatic rock drill, guided by a strong frame and fed by a pneumatic cylinder, has been described by the inventor, Mr. David Baker, in the *Transactions* for 1892, vol. xxi., page 588. The tap-hole closing-machine, invented by Mr. Samuel Vaughen, is shown by Fig. 27, in the form in which it is used by the Maryland Steel Co. It consists of a pneumatic cylinder controlled by a plain side-valve. In front of the air-cylinder is bolted a second cylinder, which is filled with balled stuff or clay, such as is used for closing the tap-hole. The clay is forced out of the nozzle of the forward cylinder and forced into the tap-hole by advancing a plunger fastened to the protruding end of the air-cylinder piston-rod.

Both the drill and the closing-machine, which is popularly known as the "gun," are swung from light cranes fastened to the furnace-columns, and are held in position, while at work, by suitable, easily detachable clamps and hooks. Together they have proved themselves time-savers, and a very valuable aid in controlling the flow of the metal from the furnace. With their aid, a cast can be made without the blast being taken off the furnace.

Fig. 27.



VAUGHEN'S TAP-HOLE CLOSING-MACHINE.

The problem of designing a practical machine for the continuous or uninterrupted casting of blast furnace metal has received considerable attention. Several patents for various contrivances, indicating the widely-felt need of such a machine, have been granted, but until a short time ago none of them had received a practical demonstration. The advantages to be gained, from an economical and metallurgical point of view, by the production of clean, uniformly-sized, sand-free pig-iron have been ably and forcibly presented by a member of the Institute, Mr. Henry D. Hibbard, in his paper on this subject, read before the British Iron and Steel Institute, in 1896. Since this paper was published experiments have been in progress, resulting in the evolution of the Uehling machine for casting, conveying and automatically loading blast-furnace metal, which is now in successful operation at the Lucy furnaces, Pittsburg, and, on the strength of its performance there, has been adopted to replace the system of sand-casting and pig-breaking hitherto used at the Duquesne furnaces. [Here follows description, which, with illustrations, is omitted, the apparatus having been fully described and illustrated in *The Iron Trade Review* of April 22.—ED.]

The importance of this new development and its effect on the arrangement of the future blast-furnace should not be overlooked or underrated. It would seem as if the metal should be run from the blast-furnace into a mixer or receiver heated with furnace gas and of sufficient capacity to hold at least two casts. From this mixer it should be cast directly into the molds of the casting-machine. With a sufficient receiver capacity, we may safely dispense with the expensive cast-house and with the host of men employed therein, and at the same time we should obtain a more uniform metal, and may tap the furnace at any time we choose. From a metallurgical point of view the advantages thus secured are equally worthy of consideration.

Sand-free pig-iron is imperatively demanded by the basic open-hearth process. The sand adhering to the iron in the form of free silica is far more destructive to the basic lining than is the silicon chemically combined in the metal. For sand-free metal the limit specified for the amount of Si in the pig may therefore be raised, admitting for use many grades and makes of iron, which, if cast in sand, would be unfit for the basic open-hearth process. The same observation applies to iron used in the puddling process. In the Bessemer works and foundry, in short, wherever the iron is melted in a cupola, absence of sand, while not affecting the composition or metallurgical value of the metal, effects a marked saving in flux, in fuel, in iron-loss in the slag, and in the labor of bringing the considerable quantity of sand to the cupola and the slag away from it. One ton of pig-iron cast in sand weighs, commercially speaking, 2,268 pounds, while 2,240 pounds is the accepted weight of one ton of sand-free iron. It is now customary to pay a premium of about 25 cents per ton for iron cast in chills over and above the price for the same iron cast in sand. Yet, the iron cast in chills is far from sand-free, as the chills are seldom perfect, being more or less patched with sand; and, besides, some sand is carried from the sand-runners and adheres to the iron. If metal cast in chills is at a premium, metal cast in the casting-machine, and therefore absolutely sand-free, should command a yet higher premium.

Many of our foundrymen, who are compelled to work without the aid of a laboratory, and who have been trained to judge their iron and to make up their mixtures from the appearance of the open fracture, will undoubtedly object to the casting in chills, which deprives them of the accustomed guide for conducting their operations. But if the foundryman would follow the example of the blast-furnace manager, who invariably judges his metal from the appearance of the fracture of a sample cast in an iron chill, he would find such a fracture more reliable and less variable than that of the slowly-cooled sand-pig. Besides it is to be hoped that the progress of the iron-casting industry will be such that before long the assistance of the chemist and the laboratory will be as helpful and indespensable in the foundry as it is to-day in the steel-plant or at the blast furnace.

In dealing with the blast furnace cinder, our methods to-day are nearly perfect. As late as in 1883 it was still customary at most blast-furnaces to form rough molds in slag, on what used to be called the cinder-wharf. Into these the hot cinder was run. It was broken before cooling and loaded on dump-cars by manual labor, or it was formed into round cakes, often with an iron staple cast into the center of each

*Read at the Chicago meeting of the American Institute of Mining Engineers, February, 1897.

cake, for convenience in handling. The cakes were lifted by a swinging crane, and loaded on cars. Men were required to prepare the molds and runners, to load the cinder, and afterwards on the dump to unload the unwieldy masses. Cinder-cars with removable tops next came into use. The repairs to these cars were heavy, and considerable labor was required to remove and replace the tops, and to bar the cakes of cinder from the flat bottoms of the cars over the dump. Of late years the Weimer gondola cinder-car has been adopted by most progressive furnace-men.

The latest form of a 200-cubic-foot Weimer car is lined either with fire-brick or with cast iron staves. The latter are said to be more durable. The repairs to these cars are very light, and they are so easily handled and cleaned that the problem of economically handling the blast furnace cinder on the dump may be considered as solved.

The Howdon slag-conveyor is a successful machine designed for handling furnace-slag destined for road-ballast. It is an English invention, operated in this country under patents controlled by the Cambria Iron Co., of Johnstown, Pa. The conveyors are manufactured by Messrs. Heyl & Patterson, Pittsburg, Pa. The function of the machine is to cast the slag automatically into shallow-pans of cast iron forming an endless belt and to cool and granulate the slag so cast by water, delivering it on cars in proper shape for road-ballast. A recent form of the Howdon conveyor has been installed at Furnaces Nos. 1 and 2 of the Cambria Iron Co.

The conveyor is 100 feet long from end to end of track. The pans are built of iron castings in three sections, bolted to one common shaft, fitted with supporting wheels, on which the pans roll over tracks constructed of heavy channels. The shafts act also as pins in the heavy link-chain which forms the conveyor. The pans overlap one another, so that no space or joint is left open, where the slag can enter and clog the conveyor. For the first 25 feet from the end of the cinder-trough the carrying-wheels travel over a horizontal track; they are then depressed in passing through a water-trough 25 feet long. The water in this trough is kept at such a level that it surrounds the pans without covering them, the object being to cool the slag without causing it to boil. The last 50-foot section of the conveyor-track has an upward pitch, sufficient to deliver the slag-cakes directly into the railroad-cars. While ascending the slope the pans are freely sprinkled with water, which, however, does not cause a boil, as the slag in passing through the water-trough has been cooled sufficiently to form a crust over its surface. The empty pans return under the bottom of the water-trough and are thoroughly cooled before they again reach the mouth of the cinder-trough. Granulation of cinder by running it through a flow of water deserves consideration. The granulated slag will find employment as road-ballast, for slag-brick and for cement manufacture. Mineral wool, or blast furnace cinder, disintegrated by steam, finds a yearly increasing market.

After all is said, the problem of handling material at the blast furnace can receive no general solution. Conditions vary, and we must select in each case the means and methods most suitable; but, given the three vital necessities, plenty of steam, plenty of wind and plenty of heat, then on the judicious and progressive solution of this problem depends the efficiency and success of the plant.

THE case of W. J. Rainey against S. K. Wallace, receiver of the Jefferson Iron Co., came before the court at Steubenville last week. Suit was brought to collect for coke furnished the Jefferson furnace, but the receiver asked for damages as an offset, claiming that the coke was too high in phosphorus, causing the output of the furnace to be off Bessemer iron. Judge Douthitt held that as the furnace was being run without a chemist the ores and not the coke might have been high in phosphorus. He held that Rainey's full claim must be paid and damages were not allowed.

THE old rail mill of the Edgar Thomson Steel Works, which has heretofore been run on light rails, has been overhauled for rolling 65-pound rails. A new furnace has been added and new rolls, and the mill began rolling standard rails on Sunday night. Its capacity is nearly equal to the present output of the new Edgar Thomson rail mill.

CYCLE MAKERS AND MACHINERY EXPORTS.

Speaking of the development of export trade in American machinery and of the part bicycle manufacturers have had in acquainting foreign countries with the superiority of the workmanship of American shops, Mr. H. A. Lozier, of Cleveland, the well-known manufacturer of bicycles and steel tubing, said recently:

"It is impossible for other countries to equal American goods until they have the means and the men. By the means I mean automatic machinery. America leads the world in these devices. Automatic machinery may be bought, but unless men know how to operate it good results cannot be obtained. As an illustration, a certain well-known French cycle maker purchased thousands of dollars' worth of American machinery. He imported it to France. The investment, however, came to practically nothing, as the French workmen could not operate it. There is no discounting a French workman's ability when it comes to certain things, but the use of automatic machinery he has not yet mastered.

"Germany comes nearer using automatic machinery according to the American ideas than any other country. The largest and best maker of automatic tools in all Germany, however, stated within the last six months that 'the Germans know nothing of automatic machinery as compared to Americans.' This statement was made in his own factory to a personal friend. England uses comparatively few automatic tools, most of the labor being done by hand. In the last six months, however, the makers of automatic tools in America have been rushed to death with demands made on them by English bicycle manufacturers, all of whom are anxious now to get in automatic machinery. The London agents of all these various American concerns are turning away orders constantly, as their factories have now more than they can do.

"The American cycle manufacturers have done more for American export business than any other one class of men since the foundation of the Republic. This may seem a very broad statement, but we believe that it is a fact. The world for years has been thinking that Americans were the finest mechanics on the globe. It was largely a theory; the aggressive American cycle makers have now made it a fact, as there is not a civilized country in either hemisphere in which at least a half-dozen American made wheels are not well and favorably known. The finish, the construction, the mechanical nicety and strength, as well as proportions, verify the opinions of all people, that American mechanics have no equal. My belief is that if other American manufacturers would follow in the paths cut out by the cycle men, and do it at once, they would find a comparatively easy entrance into the markets of the world. The hard work has largely been done, and the fruits in many instances are to be had for the asking."

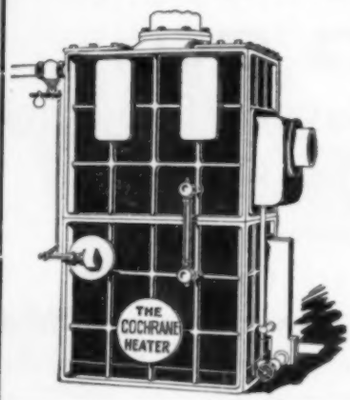
THE annual convention of the Amalgamated Association of Iron and Steel Workers is now in session at Detroit. The wage committees met at association headquarters in Pittsburg last week. They are as follows: Iron wage: M. M. Garland, chairman; Stephen Madden, secretary; Andrew McBride, Thomas Mason, Samuel Cashmore, James Matthews, John Mahan, John K. Clark, J. D. Hickey, John Dashback, Samuel Conway, Daniel Mullane, Oscar Watkins R. Llewellyn, John A. Duffy, J. H. Morgan, W. G. Roderick, M. F. Tighe, Martin Flaherty, D. Llewellyn, Theodore Schaffer, James Sadler, Thomas Bullock, Jonn Edwards, David Lloyd, John Kiddie. Steel wage: John Watkins, chairman; Frederick Brettell, John Keys, J. M. Colgan, S. C. Adams, John Each.

THE regular meeting of the Association of Iron and Steel Sheet Manufacturers was held at the Conestoga Bldg., Pittsburg, May 11. The present officers were re-elected as follows: President, J. G. Battelle; vice-president, W. T. Graham; secretary and treasurer, John Jarrett; executive committee, W. T. Graham, V. M. Caldwell, N. E. Whitaker, A. W. Brown, B. F. Butke, Warner Arms.

THE Great Western Tin Plate Co., whose works are at Joliet, Ill., has removed its general offices from the Monadnock Bldg. to the Northern Office Bldg., Lake and LaSalle sts. Chicago.

COCHRANE HEATERS.

Harrison Safety Boiler Works,
PHILADELPHIA, PA. MFRS.



No! Any old thing won't do when it comes to heaters. There's a difference in heaters as well as in shoes—a difference in the kind and quality of the material used—in the "trimmings"—in the workmanship—in the **wear**—in the satisfaction given. In the case of a shoe, you can "Put your foot in it." So you can with heaters if you do not get the right kind.

We are continually inviting comparisons—our **"COCHRANES"** against the field. How is it we sell so many of these Cochranes? Price? Well! Not exactly; our prices are particularly reasonable considering all that we furnish—but we don't bother much about what the other fellows are asking. We leave it to the buyer—first giving him a clear, accurate statement of what we are going to furnish, and of what that appliance will do.

We believe in putting the facts in cold type, so that they can be read and digested. Some of these cold facts, with illustrations, can be had for the asking.

===ANY OLD THING.===

INDUSTRIAL SUMMARY.

New Buyers in the Market, and Some of Their Wants:—

(If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.)

The Pittsburg Screw & Bolt Co., Pittsburg, Pa., has been incorporated, with a capital of $50,000, by D. A. Moore, N. C. Moore, Mary P. Smith, H. E. Bidwell, Jesse T. Lazear, N. C. Davidson, W. H. Williams and M. M. Currey.

Goodrich Lumber Co., Great Falls, Mont., is in the market for a second-hand gasoline engine of about five h. p.

D. C. S. Co., 88 W. Jackson st., Chicago, wants to buy an iron lathe of 10-inch swing or over.

The Parkersburg Rig & Reel Co. has been chartered at Parkersburg, W. Va., by Charles Chamberlain and Mike Eagan, oil men of Washington, Pa., with a capital of $10,000. A foundry and machine shop will be erected at once for the manufacture of rig irons, reels, arms and general derrick equipment.

The Chicago Mining Machine Co. has been incorporated at Chicago, with a capital stock of $80,000, by J. B. Paine, S. W. Bender, and Frank White.

A prominent coal and coke dealer in Cleveland is in the market to handle a good medium priced Virginia coke. Address B., care *The Iron Trade Review*, of Cleveland.

Additions, Enlargements, Removals, Etc.:—

The American Hoist & Derrick Co., of St. Paul, Minn., will enlarge its plant and install new machinery. The new shop will be 92x140 feet, of brick, stone, and steel. It will contain a 15-ton overhead traveling crane, a boring mill that will turn a casting weighing 16 tons, a lathe that will turn a casting eight feet in diameter; all the latest improved slotting machines, electric drills, large planers, etc. The company will also make an addition to its foundry, 6x93 in dimension to be of brick and stone with a steel roof. It will hold a cupola for melting iron, capable of reducing 20 tons an hour; an electric jib crane that will lift 20 tons.

The Brightman Mfg. Co., of Millersburg, O., will build an addition of 60 x 90 to its shops. The new department is to be used for polishing shafting and for foundry purposes.

A new brass and iron foundry will be added to the plant of the Kennedy Valve Mfg. Co., Coxsackie, N. Y. Iron and brass valves will be manufactured. A traveling crane will be installed.

New Construction:—

Edward E. Erikson, the consulting and contracting engineer, is erecting foundations, engines, rooms, etc., for the new plant of the Marsh Glass Co.

James Lathwood, the Pittsburg founder, has plans for a new plant which will be erected at 22d st., the old site having been condemned for city purposes.

The Berlin Iron Bridge Co., of East Berlin, Conn., is working full time and reports that spring business is opening up in a brisk way. Contracts on hand include a water-tower at North Berwick, Me.; large school building at East Albany, N. Y.; steel framework for the Providence Institution for Savings, at Providence, R. I.; steel framework for the new Waterbury Savings Bank, at Waterbury, Conn.; large addition to the Waterbury Farrel Foundry & Machine Co., at Waterbury Conn.; an addition to the boiler plant of the Bay State Brewery, in South Boston, Mass.; steel trusses for an opera house at Corinth, N. Y.; steel work for the new public library building at Providence, R. I.; an addition to the boiler plant of the Connecticut Hospital for the Insane, at Middletown, Conn.; new pumping station for the York Water Co., at York, Pa.; addition to the boiler plant of the Dunnell Mfg. Co., at Pawtucket, R. I.; fire-proof building for the Guggenheim Smelting Co., at Perth Amboy, N. J.; steel framework for a church at Bartlett, N. H.; besides bridges at Charlemont, Mass.; large steel bridge for Somerset County, N. J.; a steel bridge for the town of Coventry, Conn.; steel highway bridge for the town of Harmon, N. Y.; large city bridge at Vergennes, Vt.; bridge for the S. D. Warren Co., at Cumberland Mills, Me.; highway bridge at Wilmington, N. Y.

Fires and Accidents:—

The pattern room of the McElwaine-Richards Foundry & Machine Works, Noblesville, Ind., was burned out recently with a loss of $10,000, covered by insurance.

General Industrial Notes:—

The Clinton Wire Cloth Co., Clinton, Mass., has acquired a valuable extension to its present large plant by the purchase of the J. B. Parker machine shop. The property consists of one acre of land, with a fully equipped machine shop, situated alongside the Boston & Maine Railroad tracks, just across the street from the wire mills.

The Page Belting Co., of New York, has arranged with Patterson, Gottfried & Hunter, Ltd., 146-150 Center st., New York, to act as agents for its belting in New York and adjacent markets. The stock heretofore carried in warerooms and the belt shop with all appurtenances have been removed from 52 Dey st., to the larger establishment at 146-150 Center st.

The Hoffman, Billings & Weller Co., of Gadsden, Ala., has started its new works in that city for the manufacture of iron soil pipe.

At Pittsburg, in the case of the Rosedale Foundry Co., against Jennings Bros. & Co., Ltd., an order was made ratifying and confirming the sale made under the direction of the court of property formerly owned by the defendant company.

The Westinghouse Electric & Mfg. Co., of Pittsburg, Pa., will have very complete exhibits of its various lines of electrical equipment at the coming annual convention of the National Electric Light Association, to be held at Niagara Falls, N. Y., on June 7, 8 and 9. Representatives of the concern will also be present from its Pittsburg, Philadelphia, New York and other branch offices. The company's headquarters will be at the International Hotel.

Patterson, Gottfried & Hunter, Ltd., have just cmpleted

MOUNT SAVAGE FIRE BRICK.

UNION MINING CO.,

Proprietors of the CELEBRATED Mount Savage Fire Brick

GOVERNMENT ⁂ STANDARD.

Established 1841. Capacity, 60,000 Per Day; 18,000,000 Per Year.

The First Manufactory of its Kind in the U. S.

Home Office and Works:—MOUNT SAVAGE, Alleganv County, Md.

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DUCTILE CAST IRON

TENSILE STRENGTH 60,000 LBS.

HOMOGENEOUS, SOLID AND CLEAN.

HIGH ELECTRICAL PERMEABILITY.

EAST CHICAGO FOUNDRY CO., 716 THE ROOKERY, CHICAGO.

EDWARD E. ERIKSON,

CONSULTING AND CONTRACTING ENGINEER.

Steel Plants, Sheet and Tin Plants, Gas Furnaces and Producers Structural Iron and Steel.

Automatic Billet Heating Furnaces. Plans and estimates furnished.

CONESTOGA BLDG., PITTSBURG, PA.

"THE IRON TRADE REVIEW"

is an increasingly valuable medium through which to sell equipment to machine shops and foundries.

arrangements with Fairbanks, Morse & Co., of Chicago, to act as their exclusive New York agents for the sale of their gas and gasoline engines, steam pumps and wind mills. They have secured the services of S. S. Bradley, of Duluth, Minn., who has severed his connection with the New Duluth Land Co., of which he has been secretary and treasurer, to take charge of these goods for them.

A company has been formed under the title of the Landis Tool Co., which will immediately rebuild the works of the Landis Bros., Waynesboro, Pa., recently burned, and hopes are entertained of the works being again in operation in about 60 days. Dr. A. H. Stickler is president; Daniel Hoover, vice-president; J. E. Frantz, secretary and treasurer, and A. B. Landis is superintendent of the new company.

Charles C. Lewis, as assignee, will sell the land, buildings, tools and machinery of R. F. Hawkins, Springfield, Mass. The business done was that of putting up steel or iron structures, bridges, buildings, girders, etc.

The petition presented to the city council by the LaBelle Iron Works, Wheeling, W. Va., manufacturers of tin and terne plate, for the vacation of certain property may be granted soon. In the meantime the company is figuring on the erection of an additional tin plate plant of six mills with all necessary appliances.

The Sargent Co., Chicago, reports having an exceptionally good business. The works are running full time on the company's specialties, but it is also doing well on general steel castings.

The No. 3 furnace of the E. & G. Brooke Iron Co., of Birdsboro, Pa., has been blown out because of dullness in the iron trade.

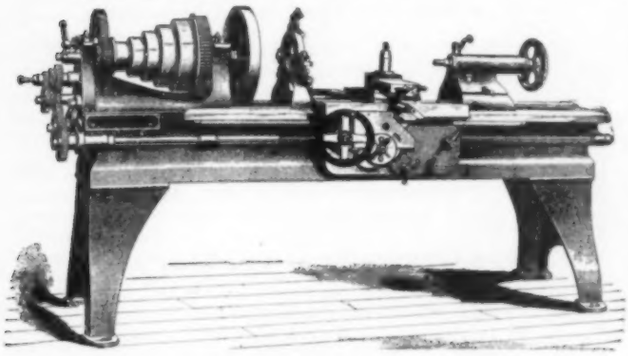
The Stewart Mfg. Co., at West Newton, Pa., has commenced the manufacture of force and lift pumps. The concern has recently been organized, and is giving employment to quite a large number of hands.

The new Pittsburg Screw & Bolt Co. has secured the old plant of the Westinghouse Machine Co., which will be equipped at once for the manufacture of screws, bolts and nuts.

The Northern Trust Co. has bought the plant of the Calumet Iron & Steel Co., under a degree of foreclosure, for $374,088.66. On Feb. 4, 1888, the Calumet Iron & Steel Co. made an issue of bonds amounting to $300,000, running to Feb. 1, 1928, with interest at six per cent. The company defaulted on its interest coupon in August, 1894, and the court made a decree of foreclosure in favor of C. L. Otis and eleven others who were holders of the bonds. The plant of the company is located in the Calumet district, just south of South Chicago,

U. BAIRD MACHINERY CO.

123 AND 125 WATER STREET, **PITTSBURG, PA.** 124 AND 126 FIRST AVENUE.



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LATHES,
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Send for List of Second-Hand Tools.

THE SUPERIOR CHARCOAL IRON CO.,

Exclusive Sellers of the Following Well Known Brands of

LAKE SUPERIOR CHARCOAL PIG IRON,

Antrim, Elk Rapids, Gaylord, Hinkle,
Peninsular, Pioneer, Spring Lake, Union.

All business connected with the sale of the above brands of Charcoal Pig Iron will, from April 1st, 1897, be handled by THE SUPERIOR CHARCOAL IRON CO., of Detroit, Mich., which is thus enabled to supply the best iron known for all purposes, especially for Car Wheels, Malleable Castings, Boiler Tubes, Ship and Armor Plate, strong high Silicon for foundry purposes, Basic Pig Iron with the minimum of Silicon and Sulphur, also iron to take the place of Salisbury, Southern, and Swedish Charcoal Iron.

OFFICERS { WM. G. MATHER, Prest. / W. H. HINKLE, Vice Prest. } F. B. GAYLORD, Secy. & Treas. { J. C. HOLT, / WM. GERHAUSER, } Sales Managers.

Office, 66 Newberry Bldg., DETROIT, MICH.

and was established in 1874 as the Joseph H. Brown Iron & Steel Co. It embraces 60 acres of land, a rolling mill and furnace.

No. 7 furnace of the Thomas Iron Co., at Lock Ridge, Pa., has resumed blast.

The Woodward Iron Co., of Birmingham, Ala., will issue $1,000,000 eight per cent bonds, to provide for working capital.

The fly-wheel of the rail mill engine at the Maryland Steel Co., Sparrow's Point, Md., broke on the 3d inst., having just been started. Preparations to blow in furnace C are being made, A and B being in blast.

The Buhl Steel Co., Aschman Steel Casting Co., and American Steel Casting Co., of Sharon, Pa., have reduced wages of laborers from $1.35 to $1.25 a day.

Pierce Bros., of Sharpsville, Pa., brought suit at Pittsburg, last week, against Corrigan, McKinney & Co., of Cleveland, for $16,000. The litigation grows out of the lease of the Douglas furnace at Sharpsville and the amount asked is claimed to cover a varied account of privileges and damages.

The Kepp Gear Wheel & Foundry Co., whose Allegheny plant was totally destroyed by fire some months ago, is just completing its new plant, and as soon as it can be equipped with new machinery will be running in full. The plant is running in part now.

Work was begun, May 17, in all departments of the Portage Iron Works, at Duncansville, Pa. The resumption is due to a large order for iron from the Pennsylvania Co., which will require several weeks' time to fill.

An injunction has been obtained by stockholders of the Scranton Steel Co. against the directors to prevent them selling in one block the $750,000 stock of the Lackawanna Iron & Steel Co., given in payment for the Scranton Steel Co.'s plant. Stockholders want this stock divided.

The Schellenbach Foundry Co., Joplin, Mo., has just completed a large plunger, weighing 3,000 pounds, for the Laflan-Rand Powder Co., Turk, Kas. It was turned upon a lathe and polished, and pronounced without a flaw. It is part of a hydraulic ram used in the manufacture of black powder.

At Youngstown, O., the Union Iron & Steel Co. has posted notices in its mills here that, commencing May 17, a reduction of 10 per cent in wages will be in effect for all employes whose wages are not governed by the Amalgamated Association.

The Haydenville Mfg. Co., manufacturer of plumbers' brass supplies, with office at 73 Beekman street, New York, and factory at Haydenville, Mass., has made an assignment to George N. Robinson, of Brooklyn, and John Mayher, of East Hampton, Mass. The liabilities are $125,000, and the assets are said to be from $125,000 to $150,000.

Every furnace in the charcoal district, Hanging Rock region, Ohio, was out of blast during the entire month of April. The Madison Furnace of Clare, Duduit & Co., at Rempel, O., and the Vesuvius Furnace at Pedro will be blown in about the 20th inst.

NEW ENTRANCE TO NEW YORK.

Passengers via Pennsylvania Lines Now Have Choice of Three.

All are convenient locations: Cortlandt street and Desbrosses street, in the down-town district, and Twenty-third street in the up-town district. The latter entrance will be formally opened May 16th, when two new and commodious ferryboats, double-deckers, constructed especially for the Pennsylvania Lines and furnished and finished in up-to-date style, will be placed in service between the Jersey City station and Twenty-third street, connecting with all inbound and outbound trains over the Pennsylvania System, the same as the boats running between that station and Cortlandt street and Desbrosses street, which will also be continued in daily service.

The Pennsylvania Lines' three entrances into New York enable passengers to quickly reach the business portion in the lower end of the city, as well as the hotels and business blocks

in the very heart of the great metropolis. The ride across the river is a delightful and refreshing termination to an enjoyable trip. All through trains from the West, over the Pennsylvania Lines, land passengers in New York between 9.30 A. M. and 9.30 P. M., treating them to a grand view of the city's water front; its extensive docks where at almost any time may be seen ships of many nations. The wonderful panorama gives visitors a slight idea of the magnitude of New York. The new Twenty-third street ferry line is particularly noteworthy in this respect.

THE Magnolia Metal Co., New York, writes us, under date of May 11: "We beg to inform you that the firm of Sugden, Pound & Wagner, of London (former selling agents for Magnolia metal in Europe, and who traded under the name of the Magnolia Anti-Friction Metal Co. of Great Britain by special permission of our company) have been dispossessed of their agency by the English courts, and that our London office and our foreign business are now under the management of Mr. Chas. B. Miller, the president of this company. Messrs. Sugden, Pound & Wagner were recently perpetually enjoined, together with the Atlas Metal Co., Ltd., of London; John Sugden, Max Wagner, Arthur George Brown, the Globe Engineering Co., Ltd., of Manchester; the Atlas Bronze Co., Ltd., and the Atlas Bronze Co., from continuing the business of making an anti-friction metal and branding it with the trade-mark of the Magnolia Metal Co., of New York, imitating their ingots, marking the boxes in which the metal is made, 'Made in the United States,' and otherwise deceiving and imposing upon purchasers of anti-friction metal in Great Britain and Europe. Justice Collins heard this case, and gave judgment against Sugden, Wagner, Brown, the Globe Engineering Co., Ltd., and others for selling counterfeit goods and representing that the goods they sold were made in the United States by the Magnolia Metal Co. An appeal was taken from the injunction above referred to. This appeal was tried before the Court of Appeals, Lord Esher presiding, and the perpetual injunction granted by Justice Collins was confirmed. It has come to our notice that parties in this country have attempted to perpetrate a similar fraud, and we now have one Western firm in the courts over this matter, and we desire to warn the engineers and the general public, users of anti-friction metal, against these fraudulent attempts to pirate and appropriate the use of our trade-marks and name of our metal. Every bar of Magnolia metal bears the steel stamp of the Magnolia flower and the impression of the steel die, 'Patented June 3rd, 1890, and 'Manufactured in the United States,' with the exception of the metal manufactured by this company in Russia, which bears the stamp of the Magnolia flower and the words, 'Manufactured in Russia."

EXCURSIONS TO NASHVILLE.

Low Rates for Tennessee Centennial.

The Tennessee Centennial and International Exposition will be in progress at Nashville, Tenn., from May until October inclusive. Special low rate round trip tickets will be sold via Pennsylvania Lines for this event. Full particulars concerning fare, dates of sale, time of trains, etc., may be obtained upon application to nearest Pennsylvania Line Ticket Agent, or by addressing C. L. Kimball, Assistant General Passenger Agent, Cleveland, O.

PRESBYTERIAN GENERAL ASSEMBLY.

Low Rates via Pennsylvania Lines.

Warsaw, Ind., (Winona Assembly Grounds, Eagle Lake), where the Presbyterian General Assembly will meet this year is on the Fort Wayne Route of the Pennsylvania Lines, over which passengers are landed at the entrance to the grounds. Excursion tickets will be on sale over these lines May 17th to 25th, inclusive. Details regarding rates, time of trains, etc., may be obtained by applying to nearest Pennsylvania Line Ticket Agent, or addressing F. Van Dusen, Chief Assistant General Passenger Agent, Pittsburg, Pa.

SUMMER OUTINGS.

Seashore, Mountain and Lake Resorts.

The principal places of summer sojourn along the Atlantic Ocean, in the Alleghenies, the Adirondacks, Catskills, and Mountains of the East, and in the Lake Region and Northern Michigan and the Northwest, may be readily reached over the Pennsylvania Lines.

Special information regarding the leading resorts and the advantages enjoyed in journeying to them over the Pennsylvania Route has been compiled and printed in convenient form. The matter is profusely illustrated with photographic reproductions of seashore scenes and includes views at Atlan-

Steam Yachts and Marine Machinery.

Also Towing Launches built by Marine Iron Works, Clybourn and Southport avenues, Chicago. Free illustrated catalogue. Write them for it.—*Adv.*

"Metallurgy of Cast Iron,"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer, Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1142 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge, been issued in this or any other country."

DOES YOUR ROOF LEAK?

If an old leaky tin, iron or steel roof, paint it with Allen's Anti-Rust Japan. One coat is enough; no skill required; costs little; lasts long.

The name describes it; proof against water, time, climate, and fumes of every description. Stops leaks, and prolongs the life of an old roof.

If you want evidence write us.

To be returned at our expense if not satisfactory.

This Anti-Rust is also of highest value in protecting metal pipes, fans, etc., at mines, exposed to the corroding effects of *mine air* and *mine water*.

ALLEN ANTI-RUST MFG. CO.,
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GUARANTEED TO OPERATE PERFECTLY OR NO PAY. MADE FOR ALTERNATING OR DIRECT CURRENT. ANY VOLTAGE. CATALOGUE FREE.

AUTOMATIC CIRCUIT BREAKER COMPANY, NEWAYGO, MICHIGAN, U. S. A.

LOCATIONS FOR INDUSTRIES.

The name of the Chicago, Milwaukee & St. Paul Railway has long been indentified with practical measures for the general upbuilding of its territory and the promotion of its commerce, hence manufacturers have an assurance that they will find themselves at home on the company's lines.

The Chicago, Milwaukee & St. Paul Railway Company owns and operates 6,154 miles (9,902 kilometers) of railway, exclusive of second track, connecting track or sidings. The eight States traversed by the lines of the company, Illinois, Wisconsin, Northern Michigan, Iowa, Missouri, Minnesota, South Dakota, and North Dakota, possess, in addition to the advantages of raw material and proximity to markets, that which is the prime factor in the industrial success of a territory—a people who form one live and thriving community of business men, in whose midst it is safe and profitable to settle. Many towns on the line are prepared to treat very favorably with manufacturers who would locate in their vicinity

Mines of coal, iron, copper, lead and zinc, forests of soft and hard wood, quarries, clays of all kinds, tan-bark, flax and other raw materials exist in its territory in addition to the vast agricultura resources.

A number of new factories have been induced to locate—largely through the instrumentality of this company—at towns on its lines. The central position of the States traversed by the Chicago, Milwaukee & St. Paul Railway, makes it possible to command all the markets of the United States. The trend of manufacturing is Westward. Nothing should delay enterprising manufacturers from investigating. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address **LUIS JACKSON,**
Industrial Commissioner, C., M. & St. P. R'y
425 Old Colony Bldg., CHICAGO, ILL.

S. FIX SONS'
STEAM TUBE WELDING WORKS.

Manufacturers of reworked boiler tubes
Good second-hand tubes bought.

CLEVELAND, O.

The Iron Trade Review has a rapidly growing constituency in the great Central Zone, the best buying section in the country, as machinery manufacturers and establishments devoted to power equipment have found out in the past three years. Between the Alleghenies and the Mississippi are located many of the most prosperous industries in the country, and they have been buyers when there was only limited business in other sections. Advertisers are coming to recognize this fact, as the growing patronage of the columns of this paper gives abundant testimony.

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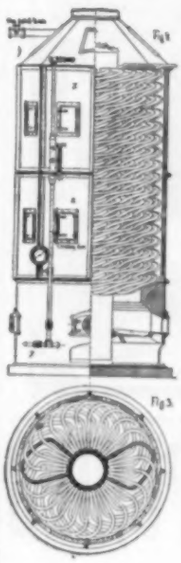
BROOKLYN, N. Y.



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No Screw Joints. No Metallic Joints. No Ground Joints. No Packing Joints. No Cast Iron Pipes. Manifolds or Headers to cause trouble from Unequal Expansion or Contraction.

Quick and Steady Steamers,
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The A B C of Iron.

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

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We have learned that **HEATING SURFACE** does not always mean **HORSE POWER;**

It depends upon getting the HEAT to the SURFACE.

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THE TUBULAR STEAM BOILER.

Write us for Prices and Specifications. You need not unload the goods off the car if not as represented.

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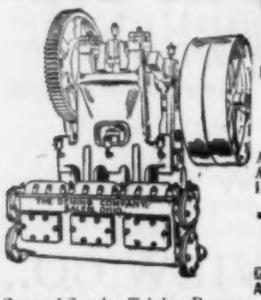
Will be sent postpaid by *The Iron Trade Review* at $6.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works.



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Four Types and Eight Sizes for ELECTRIC AND OTHER POWER.
SINGLE AND DOUBLE-ACTING CYLINDERS.

Unequaled in Design and Construction.

Adapted for Water Works, Hydraulic Elevators, Boiler Feeding, Apartment Houses, Mine Pumping, Irrigation, Paper Mills, Refineries, Breweries, Etc. MADE BY

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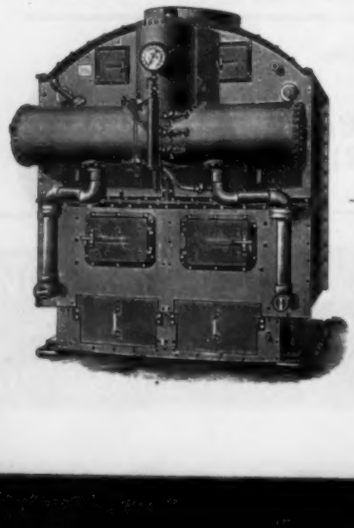

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Steamships, River Steamers, both propellers and stern wheels, Torpedo Boats, Fire Boats, Yachts and Launches, Donkey Boilers for Steamships, and for all kinds of Stationary Work.

This Boiler possesses more advantages than any other Boiler.

It has STOOD THE TEST of over seven years' constant daily use in passenger steamers, and is in use in many of the best steam yachts. It has proved its durability to be equalled by none. It has shown from 10 to 15 per cent saving in every day work over the best Marine Fire-Tube Boiler.

It is one-third the weight of the Scotch Boiler for the same power and efficiency. It is non-explosive. No priming, and easy to manage.

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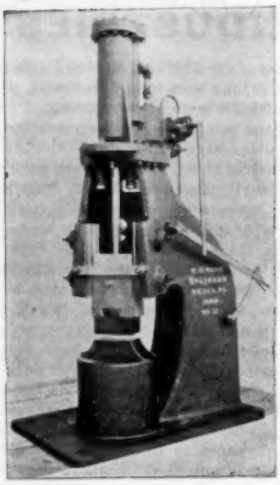

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* Daily. † Daily, except Sunday.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 1:40 pm	*11:25 am
Baltimore and Washington	* 1:40 pm	*11:25 am
Alliance and Pittsburgh	* 1:40 pm	*11:25 am
Ravenna and Alliance	* 5:00 pm	* 8:30 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Xenia and Cincinnati	* 8:10 am	* 5:45 pm
Akron and Columbus	* 8:10 am	* 5:45 pm
Akron and Columbus	† 1:40 pm	†12:10 pm
Columbus and Cincinnati	* 8:00 pm	* 7:30 am

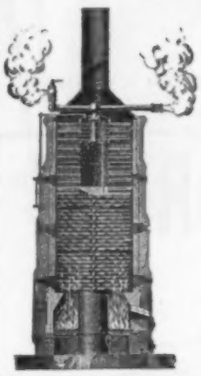
The Cleveland Terminal & Valley R. R. Co

(B. & O. System.)

Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations	*6:30 P M	*7:10 A M
Akron, Canton & Valley Jct	*10:10 A M	*3:15 P M
Akron, Canton & Chicago	*8:10 A M	*6:30 P M
Akron, Canton & Wooster, Defiance, Garrett, Marietta, Wheeling, Washington, D. C., and Baltimore	†2:55 P M	†11:00 A M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago.

The Great Coal Saver and Producer of Dry Steam.



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THE PIONEER VERTICAL WATER-TUBE BOILER
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16 Years' Unequalled Record for Economy, Safety and Durability.

No Explosions or Accidents of Any Kind.

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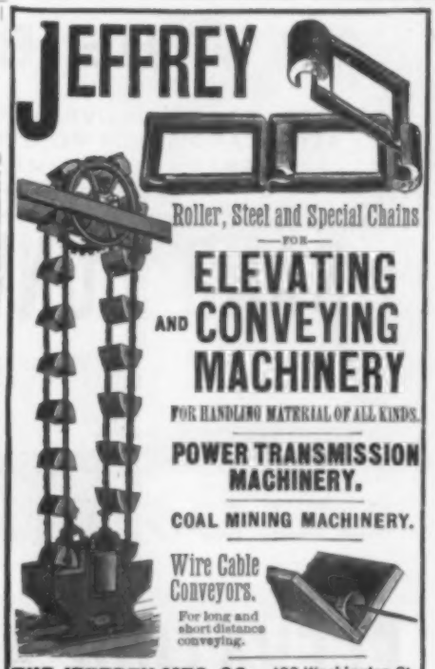

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ELEVATING AND CONVEYING MACHINERY

FOR HANDLING MATERIAL OF ALL KINDS.

POWER TRANSMISSION MACHINERY.

COAL MINING MACHINERY.

Wire Cable Conveyors.
For long and short distance conveying.

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163 Washington St. NEW YORK.

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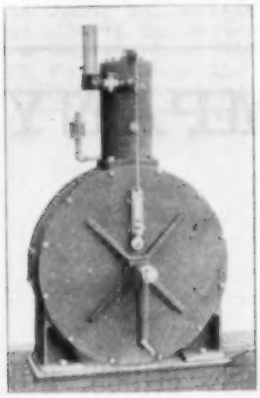

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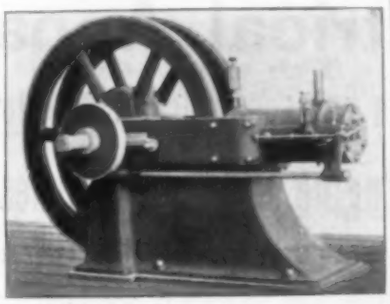

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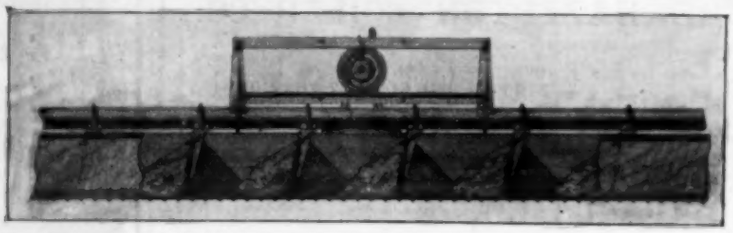

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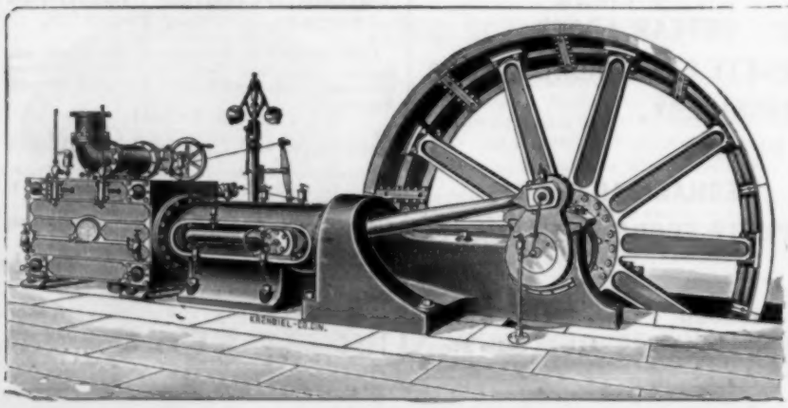

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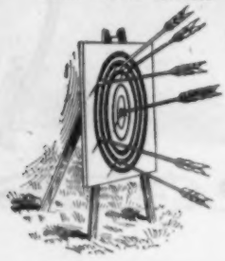

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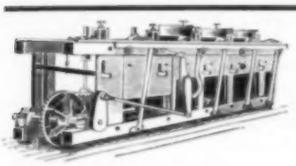

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Harrison Safety Boiler Works, Philadelphia, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Reese, Hammond & Co., Bolivar, Pa.
Clearfield Fire Brick Co., Clearfield, Pa.
Dover Fire Brick Co., Cleveland.
F. B. Stevens, Detroit, Mich
Stuart Fire Brick Co., Pittsburg, Pa.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flasks—
Brass Founders' Supply Co., Newark, N. J.

Foot and Power Lathes—
Lodge & Shipley Machine Tool Co., Cincinnati

Foundries—
Wm. Tod & Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O
Fulton Steam Boiler Wks. & Fdy., Richmond, Ind.
W. A. Jones Foundry Co., Chicago.
East Chicago Foundry Co., Chicago.

Foundry Supplies—
Newport Sand Bank Co., Newport, Ky.
Clearfield Fire Brick Co., Clearfield, Pa.
Stuart Fire Brick Co., Pittsburg, Pa.
F. B. Stevens, Detroit, Mich.
Brass Founders' Supply Co., Newark, N. J.
The Ohio Sand Co., Conneaut, O.
Jackson Sand Mining Co., Jackson, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland.

Friction Metal—
Magnolia Metal Co., New York City, N. Y.

Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.
U. S. Fuel Oil Equipment Co., Philadelphia, Pa.

Galvanizers—
Cleveland Galvanizing Works, Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,

Gray Iron Castings—
Kurtz & Buhrer, Foundry Co., Chicago, Ill.
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.

Hammers—
Beaudry & Co., Boston, Mass.
Wm. H. Wood, Media, Pa.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Moore Mfg. Co., Milwaukee, Wis.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Heating and Ventilating Apparatus—
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.

Hoisting Machinery—
Link Belt Machinery Co., Chicago, Ill.

Hydraulic Machinery—
Stilwell-Bierce & Smith Vaile Co., Dayton, O.
Wm H Wood, Media, Pa.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
Cambria Iron Co., Johnstown, Pa.

Iron and Steel Roofing—
Sykes Iron & Steel Roofing Co., Niles, O.
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Iron Ore—
Lake Superior Consolidated Iron Mines, New York City, N. Y.
Oglebay, Norton & Co Cleveland
J. Wesley Pullman Philadelphia Pa.
Pickands, Brown & Co., Chicago, Ill.
M. A. Hanna & Co., Cleveland, O.
Drake, Bates & Co., Cleveland, O.
Chas. F. Rand. Prest., New York City.

Iron Working Tools—
Toledo Machine & Tool Co., Toledo, O.
H. Bickford, Lakeport, N. H
Lodge & Shipley Machine Tool Co., Cincinnati.
C. H. Besly & Co., Chicago, Ill.
John Adt & Son, New Haven, Conn.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia
Dietz, Schumacher & Boye, Cincinnati, O

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.,

PITTSBURG, PA.,

The leading manufacturers of Electrical Apparatus for Electric Lighting, Power Transmission, and Electric Railway Plants.

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The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

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Lodge & Shipley Machine Tool Co., Cincinnati
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Diamond Machine Co., Providence, R. I.
Dietz, Schumacher & Boye, Cincinnati, O.

Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Lodge & Shipley Machine Tool Co., Cincinnati.
Dietz, Schumacher & Boye, Cincinnati, O.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
Toledo Machine & Tool Co., Toledo, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.

Machinery and Tool Steel—
W. H. Bosworth, Cleveland, O.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Cambria Iron Co., Johnstown, Pa.
Junction Iron & Steel Co., Mingo Junction, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Metal Bearings—
North American Metaline Co., Long Island City, N. Y.

Metal Saws—
Q. & C. Co., Chicago, Ill.

Metal Stamping—
Oliver P. Clay Co., Cleveland, O.

Milling Machines—
Lodge & Shipley Machine Tool Co., Cincinnati.

Mining Machinery—
Bucyrus Steam Shovel & &redge Co., South Milwaukee, Wis.
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Gates Iron Works, Chicago, Ill.
W. H. Bosworth, Cleveland, O.

Motors—
Westinghouse, Church, Kerr & Co., New York City.
Westinghouse Electric & Mfg. Co., Pittsburg
General Electric Co., Schenectady, N. Y.
Card Electric Co., Mansfield, O.

Molding Sand—
Ohio Sand Co., Conneaut, O.
Newport Sand Bank Co., Newport, Ky.
Jackson Sand Mining Co., Jackson, O.

Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.

Oil Burners—
W. S. Rockwell & Co., New York City.
U. S. Fuel Oil Equipment Co., Philadelphia, Pa.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
Diamond Machine Co., Providence, R. I.

Oil Extractors—
Jas. L. Robertson & Sons, New York.

Oil Pumps—
C. H. Besly & Co., Chicago, Ill.

Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Gates Iron Works, Chicago, Ill.

Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Jas. L. Robertson & Sons, New York.

Paint—
Iron Clad Paint Co., Cleveland.
Jos. Dixon Crucible Co., Jersey City, N. J.
Allen Anti-Rust Mfg. Co., Cincinnati, O.

Pattern Works—
Gobeille Pattern Co., Cleveland, O.

Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago.

Phosphor Bronze Castings—
Nolte Brass Co., Springfield, O.
Lorain Foundry Co., Lorain, O

Pig Iron—
Pickands, Brown & Co., Chicago, Ill.
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
W. H. Bosworth, Cleveland, O.
The Superior Charcoal Iron Co., Detroit, Mich
Bourne-Fuller Co. Cleveland, O.
J. Wesley Pullman Philadelphia Pa.
M. A. Hanna & Co., Cleveland, O.

Pipe Covering—
C. H. Besly & Co., Chicago, Ill.

Pipe
W. H. Bosworth, Cleveland, O.

Planers—
Lodge & Shipley Machine Tool Co., Cincinnati.
U. Baird Machinery Co., Pittsburg, Pa.

Plates—
Enterprise Boiler Co., Youngstown, O.

Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.

Pneumatic Appliances—
Clayton Air Compressor Works, New York.

Polishing Machines—
Diamond Machine Co., Providence, R. I.

Portable Forges—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.

Power Machinery—
Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.

Presses—
Toledo Machine & Tool Co., Toledo, O.
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago, Ill.

Pressure Reducing Valves—
W. H. Bosworth, Cleveland, O.

Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.

Pumps (Steam)—
Battle Creek Steam Pump Co., Battle Creek, Mich.
Deming Co., Salem, O.
The Edward P. Allis Co., Milwaukee, Wis.
Henry R. Worthington, Brooklyn, N. Y.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
W. H. Bosworth, Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.

Radial Drills—
Dietz, Schumacher & Boye, Cincinnati, O.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland.

Riveting Machinery—
Wm. H. Wood, Media, Pa.

Rock Drills—
Rand Drill Co., Chicago, Ill.

Roller Bearings—
Ball Bearing Co., Boston, Mass.

Rolling Mill Machinery—
The Lloyd-Booth Co., Youngstown, O.

Roofs—
Shiffler Bridge Co., Pittsburg.

Roofing Paint—
Allen Anti-Rust Mfg. Co., Cincinnati, O.

Sand and Chill Rolls—
The Lloyd-Booth Co., Youngstown, O.
Lorain Foundry Co., Lorain, O.
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.

Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O
Chicago Screw Co., Chicago, Ill.

Shafting—
The Lane & Bodley Co., Cincinnati, O.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Toledo Machine & Tool Co., Toledo, O.
Wm. H. Wood, Media, Pa.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland.
Ætna-Standard Iron & Steel Co., Bridgeport, O

Special Machinery—
Toledo Machine & Tool Co., Toledo, O.
Edwin Harrington Son & Co., Philadelphia.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago, Ill.

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Hammers—
Beaudry & Co., Boston, Mass.

Steam Shovels and Dredges—
Bucyrus Steam Shovel & Dredge Co., Bucyrus, O.
Marion Steam Shovel Co., Marion, O.

Steam Separators—
Jas. L. Robertson & Sons, New York.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
Pittsburg Tool Steel Co., Pittsburg, Pa.

Steel Castings—
Wm. Jessop & Sons, Ltd., New York, N. Y.
The Sargent Co., Chicago, Ill.
W. H. Bosworth, Cleveland, O.

Steel Rails, Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland
Bethlehem Iron Co., South Bethlehem,
Cambria Iron Co., Johnstown, Pa.

Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland.

Stokers—
Playford Stoker Co., Cleveland, O.
Brightman Furnace Co., Cleveland, O.
Westinghouse, Church, Kerr & Co., New York City.

Tanks—
Enterprise Boiler Co., Youngstown, O.

Tinning Machinery—
W. H. Bosworth, Cleveland, O.
The Lloyd-Booth Co., Youngstown, O.

Tin Plate—
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Tin and Terne Plates—
B. P. Crane & Co., Chicago, Ill.

Tool Steel—
Wm. Jessop & Sons, Ltd., New York, N. Y.
C. H. Besly & Co., Chicago, Ill.
Pittsburg Tool Steel Co., Pittsburg, Pa.

Transmission Machinery—
Link-Belt Machinery Co., Chicago, Ill.

Tube Welding—
S. Fix Sons, Cleveland.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland.
W. H. Bosworth, Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

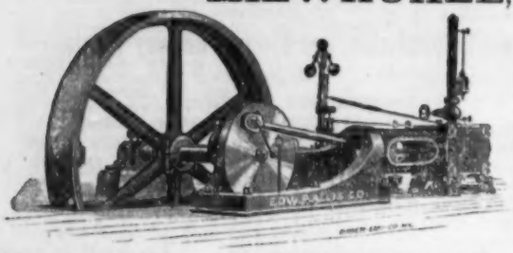
Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

Wire Machinery—
John Adt & Son New Haven Conn.
Turner, Vaughn & Taylor Co., Cuyahoga Falls, Ohio.

THE EDWARD P. ALLIS COMPANY

MILWAUKEE, WIS.



MANUFACTURERS OF

ICE and REFRIGERATING MACHINERY, Blowing Engines, Hoisting Engines, Pumping Engines, Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining, Milling and Smelting Machinery.

Reynolds Corliss Engines.

NEW YORK. CHICAGO. MINNEAPOLIS. DENVER. BUTTE. CITY OF MEXICO. SAN FRANCISCO PITTSBURG.

Not every insertion of every advertiser's card brings an order for the advertiser's good; no more does every visit of the traveling salesman result in a sale.

There is a vast deal in familiarity with the type and phrase in which a manufacturer makes himself known to the advertisement reader, just as the personal acquaintance of his traveling salesman gets him a hearing when a strange face and a strange voice are bowed out with a "busy day's" courtesies.

The best advertisers, the most successful advertisers, the advertisers who get returns, are those who keep everlastingly at it.

This is a case in which familiarity breeds business.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3.40@3.46
No. 1 Specular, Bessemer	3.05@3.17
No. 1 Bessemer hematite	2.60@2.90
Hematites No. 1 non-Bessemer	2.20@2.30
No 1. Specular, non-Bessemer	2.40@2.62

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$ 9 75@ 9 90
No. 1 Strong Foundry	10 40@10 65
No. 2 Strong Foundry	9 90@10 15
No. 1 Gray Forge, red short	... ... 8 90
No. 2 Gray Forge, neutral	9 00@ 9 15
No. 1 American Scotch	... ... 10 65
No. 2 American Scotch	... ... 10 15
Lake Superior Charcoal	... ... 13 50
PITTSBURG:	
No. 1 Foundry	$10 25@10 50
No. 2 Foundry	9 25@ 9 40
Gray Forge	8 50@ 8 65
White and Mottled	... ... 8 75
Warm Blast Charcoal	14 50@15 00
Cold Blast Charcoal	... ... 18 00
Bessemer	9.20@ 9 50
CHICAGO:	
Lake Superior Charcoal	$13 00@13 25
Local Coke Foundry No. 1	10 25@10 75
Local Coke Foundry No. 2	10 25@10 50
Local Coke Foundry No. 3	10 00@10 25
Local Scotch Foundry No. 1	10 50@10 75
Local Scotch Foundry No. 2	10 25@10 50
Local Scotch Foundry No. 3	10 00@10 25
Southern Coke No. 1	10 25@10 00
Southern Coke No. 2	9 75@10 00
Southern Coke No. 3	9 50@ 9 75
Southern No. 1 Soft	9 75@10 25
Southern No. 2 Soft	9 50@ 9 75
Southern Silveries	10 25@10 50
Jackson Co. Silveries	13 00@15 00
Ohio Silveries No. 1	13 00@15 00
Ohio Strong Softeners	12 00@12 25
Alabama Car Wheel	16 50@16 00
Malleable Bessemer	11 50@12 00
Coke Bessemer	11 50@12 00
CINCINNATI (reported by Rogers, Brown & Co.)	
Southern Coke No. 1, Foundry	9 25@$ 9 50
Southern Coke No. 2 and No. 1 Soft	8 50@ 8 75
Hanging Rock Coke, No 1	12 50@13 50
Hanging Rock Charcoal No. 1, Fdy	14 50@15 50
Tennessee Charcoal No 1	12 50@13 00
Jackson County Silvery No 1	12 50@13 00
Southern Coke, Gray Forge	8 00@ 8 25
" " Mottled	... ... 8 00
Standard Georgia Car Wheel	14 25@15 00
Tennessee " "	13 00@14 00
Lake Superior " "	14 75@15 25
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$ $10 75
No. 2 Foundry Strong Coke Iron Lake Superior Ore	... ... 10 50
Ohio Strong Softener No. 1	... ... 11 75
Jackson Co. Silvery No. 1	... ... 14 00
Lake Superior Charcoal	... ... 14 00
Southern Soft No. 1	... ... 10 75
Hanging Rock Charcoal	... ... 17 00
ST. LOUIS:	
Southern Coke No 1	$... ...$10 25
Southern Coke No. 2	... ... 9 75
Southern Coke No. 3	... ... 9 25
Southern Gray Forge	... ... 9 00
Southern Charcoal No. 1	... ... 15 00
Missouri Charcoal No. 1	... ... 14 00
Ohio Softeners	... ... 14 00
Lake Superior Car Wheel	... ... 15 50
Southern Car Wheel	... ... 15 00

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$12 50
Old steel rails	10 50
Old car wheels	10 00
	NET TONS
No. 1 R. R. wrought scrap	$10 00
Mill scrap	7 50
No. 1 Machine cast scrap	8 50
Iron axles	14 00
Axle turnings	7 00
Wrought turnings (free from cast)	6 25
Cast borings	5 00
Uncut wrought iron boilers	4 00
Steel boiler plates	8 00
Grate bars	5 00
Pipes and flues (clean)	7 50
Tank iron	8 00
Hoop and band iron	6 00
Sheet iron	5 00
Wrought drillings	6 00
Malleable iron	8 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.65c
Angles	1.10c
Tees	1.25c
Universal Plates	1.15@1.20c
Sheared Plates	1.20c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares.—Bar Iron.

1 to 1⅞	1.10 Base
2 to 2⅞	.20 extra
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6½	2.20 "

PERFORATED METALS

OF ALL KINDS FOR

MILLING, MINING AND AGRICULTURAL MACHINERY.

Perforated Iron, Steel, Copper, Brass, Tin, Zinc, Lead, Etc., to Order.
Large and Varied Assortment of Sizes. Correspondence Solicited.

THE ROBERT AITCHISON PERFORATED METAL CO.,

Office, Room 510, 265 to 269 Dearborn St., CHICAGO, ILL. Works, So. Chicago.

Dixon's Pure Flake Graphite

Is a Blessing to Every Engine Room and Machine Shop.

A small quantity added to any Oil or Grease largely increases its lubricating value and makes the finest Cooling Mixture.

Pamphlet and Sample Sent Free.

JOS. DIXON CRUCIBLE CO., Jersey City, N. J.

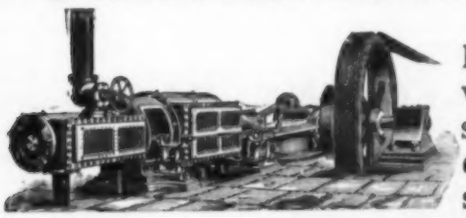
Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

WILLIAM TOD & CO.

YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



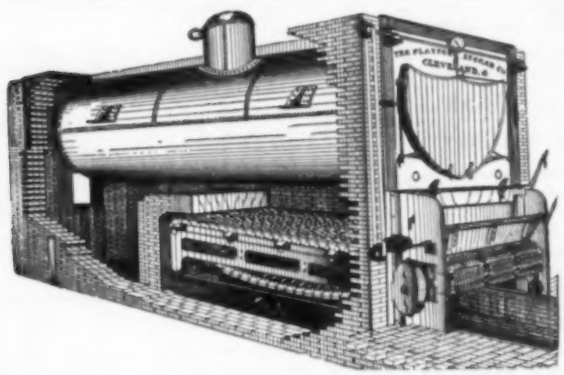
Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Williams Improved Vertical Engines

For Direct Electrical and all High Class Work.

39-41 Cortland St., N. Y. E. F. WILLIAMS.

Park Building, Pittsburg, SEWARD S. BABBITT.



The Playford Mechanical Stoker

Guaranteed to

Abolish smoke, to increase boiler capacity and to save fuel.

For information, address,

The Playford Stoker Co.,

No. 61 Case Library Bldg.,

CLEVELAND, O.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND OHIO.

Trade Mark Painted.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

6½ to 7¾	2.50 extra
¼ to ⅜	.10 "
½ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 5-32	.40 "
⅜ to 13-32	.50 "
5-16 to 11-32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.05 Base.
4¼ to 6 x ⅜ to 1	.10 extra.
6¼ to 8 x ⅜ to 1	.60 "
8¼ to 10 x ⅜ to 1	.80 "
1⅜ to 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¼ to 15-16 x ⅜ to ¾	.40 "
⅝ to 11-16 x ⅜ to ⅝	.50 "
½ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅝ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅝ to 11-16 x ¼ to 5-16	.80 "
½ to 9-16 x ¼ to 5-16	1.00 "
⅜ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra.
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1⅝ to 4 x No. 9 to 3-16	.40 "
1⅝ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅜ x No. 9 to 3-16	1.50 "
⅜ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in. .70

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1½	.40 extra.
¼ to 13-16	.50 "
⅜ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
½ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅛	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra.
⅞ to 2	.50 "
¼ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes .1 c. extra.

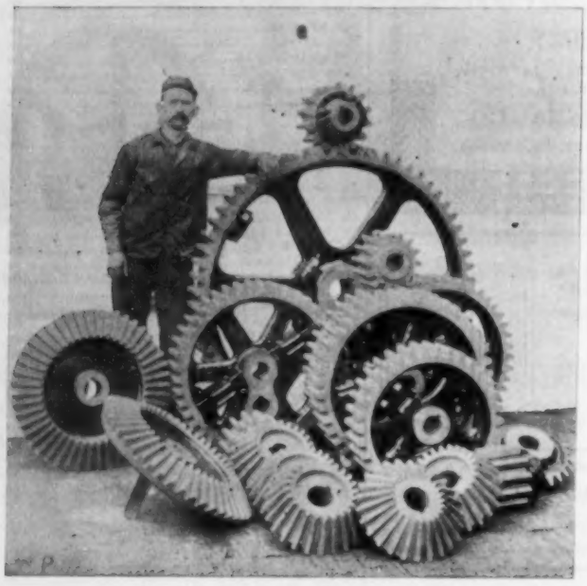
Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base. Extras.
1½ to 6,	" 10, 11, 12 or 1/4"	.05 per 100 lbs.
1 to 1½,	" 7, 8, 9 or 3-16"	.10 "
1 to 1⅜,	" 10, 11, 12 or 1/4"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or 1/4"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10 11, 12 or 1/4"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10 11, 12 or 1/4"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or 1/4"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-16	" 10, 11, 12 or 1/4"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or 1/4"	1.05 "

Iron and Steel Hoops.

Width in Inches.	English Standard Gauge.	
1 7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base Extras
1 7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs.
1 7-16 to 2,	" 20	.10 "
1 7-16 to 2,	" 21	.15 "
1 7-16 to 1¾,	" 22	.25 "
1 ⅜ to 1¾,	" 13, 14 and 15	.05 "
1⅜ to 1¾	" 16, 17 and 18	.10 "



How much Water can you carry in a Sieve?

How much Money are you losing in Waste-power?

We can Save you some of it by replacing your

CAST TOOTH GEARS

with those having

CUT TEETH.

TRY IT.

R. D. NUTTALL CO.,

179 BOQUET STREET, ALLEGHENY, PA.

THE BRASS FOUNDERS' SUPPLY CO.

FURNACES, FLASKS, FOUNDRY Supplies and Specialties.

Send for our Catalogue and look at the Ribbed Flask.

R. M. BARNETT. 20-34 Prospect St., **NEWARK, N. J.** J. S. MUNDY.

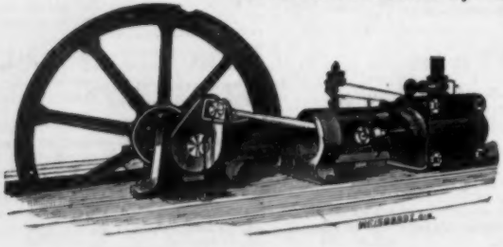
WORLD'S FAIR AWARD.

We are the only Steel Roofing Co. awarded Medal and Diploma for **PATENT CAP ROOFING** at World's Columbian Exposition. We are also large manufacturers of all styles of **METAL ROOFING, SIDING, CEILING, ETC.** Send for Catalogue and Price List. Mention this paper.

SYKES IRON & STEEL ROOFING CO., Chicago and Niles, O.

THE LANE & BODLEY CO.,

CINCINNATI, OHIO.



Engines,

ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pulleys.

Belt Elevators, Saw Mills.

1⅛ to 1⅜,	"	19 and 20	.15 per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	.10 "
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞,	Nos. 13, 14 and 15		.20 "
⅞,	" 16, 17 and 18		.25 "
⅞,	" 19 and 20		.30 "
⅞,	" 21		.35 "
⅞,	" 22		.45 "
¾ and 13-16	Nos. 13, 14 and 15		.30 "
¾ and 13-16	" 16, 17 and 18		.35 "
¾ and 13-16	" 19 and 20		.40 "
¾ and 13-16	" 21		.45 "
¾ and 13-16	" 22		.50 "
¾ and 13-16	" 23		.60 "
11-16,	Nos. 13, 14 and 15		.35 "
11-16,	" 16, 17 and 18		.40 "
11-16,	" 19 and 20		.50 "
11-16,	" 21		.60 "
11-16,	" 22		.70 "
11-16,	" 23		.80 "
⅝,	Nos. 13, 14 and 15		.40 "
⅝,	" 16, 17 and 18		.45 "
⅝,	" 19 and 20		.55 "
⅝,	" 21		.65 "
⅝,	" 22		.75 "
⅝,	" 23		.85 "
9-16,	" 13, 14 and 15		.45 "
9-16,	" 16, 17 and 18		.50 "
9-16,	" 19 and 20		.60 "
9-16,	" 21		.70 "
9-16,	" 22		.80 "
9-16,	" 23		.90 "
½,	" 13, 14 and 15		.55 "
½,	" 16, 17 and 18		.60 "
½,	" 19 and 20		.70 "
½,	" 21		.80 "
½,	" 22		.90 "
½,	" 23		1.00 "
7-16,	" 13, 14 and 15		.80 "
7-16,	" 16, 17 and 18		.90 "
7-16,	" 19 and 20		1.00 "
3⅛,	" 13, 14 and 15		1.00 "
3⅛,	" 16, 17 and 18		1.10 "
3⅛,	" 19 and 20		1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

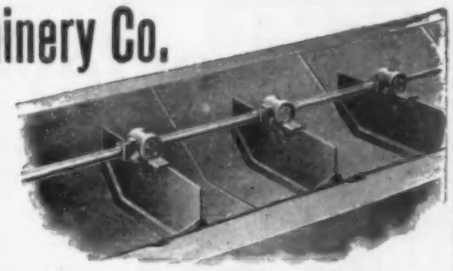
The Link-Belt Machinery Co.

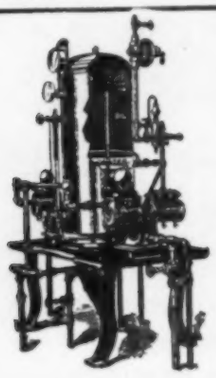
ENGINEERS. FOUNDERS. MACHINISTS.

CHICAGO, U. S. A.

Modern Methods as applied to the handling of Iron Ore, Coal, Raw and Manufactured Products.

Manila Rope, Power Transmissions, Shafting, Pulleys, Shaft Bearings, Gearing Friction Clutches, etc.





IMPROVED DUPLEX SYSTEM

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BURNING FUEL OIL.

Heats and cleans the oil and delivers it to the fires under high and uniform pressure.

Entirely automatic, most scientific, sensible and economical method of burning oil in existence. If you are operating a Steel Works, Brass or Copper Rolling Mill, Malleable Iron Works, Bolt and Nut Works, Bicycle Works, or do Annealing, Forging, Brazing, Tempering, Japanning, Enameling, Case Hardening, you can use this machine to your advantage.

WE BUILD FURNACES OF ALL KINDS. SATISFACTION GUARANTEED.

W. S. ROCKWELL & CO.,

26 CORTLANDT STREET, NEW YORK.

THE U. S. FUEL OIL EQUIPMENT CO.,

530 BOURSE, PHILADELPHIA, PA.,

Are in line to equip Manufacturers with everything required for economically burning oil in Iron heating furnaces of every character, on most favorable terms, and with guarantees of efficiency which is unusual. To introduce their system in several different directions promptly, they offer to put in **THEIR EQUIPMENT** in a **LIMITED NUMBER OF PLACES** where oil **IS NOW BURNED AT A DISADVANTAGE** and **LEASE THE EQUIPMENT FOR A RENTAL** equivalent to **ONE-HALF THE SAVINGS** they can effect. **THIS OFFER IS BONA FIDE. ADDRESS** as above or

C. E. BILLIN, 1534 Marquette Bldg., CHICAGO.

STUART FIRE BRICK CO.

MANUFACTURERS OF

Silica Brick

For Open-Hearth, Basic and Acid Steel Furnaces, Glass and Copper Tank Furnaces. Extra Shapes MADE TO ORDER.

Office, Room 21, Conestoga Bldg., Cor. Wood and Water Sts., PITTSBURG, PA.

The Chicago & North-Western Railway

REACHING with its 7,966 miles of road the famous Water Powers, Coal Fields, Iron Ore Ranges, Hard and and Soft Lumber Districts located in Illinois, Wisconsin, Michigan, Iowa, Minnesota, South Dakota, North Dakota, Nebraska and Wyoming, and by traffic arrangements with other railways, 7,350 stations located on 41,000 miles of railroad (one-ninth of the entire railroad mileage of the world, and one-fourth of the railroad mileage of the United States), has on its line more industries than any other western railroad.

Manufacturers contemplating moving or establishing branch factories in the West are requested to inquire what we can offer them before locating elsewhere.

M. HUGHITT,
General Freight Agent,
CHICAGO.

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	¼c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to 5/8 thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 80
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts lbs.
1 to 2 in. inclusive	.08
9-16 to ⅝ in. "	.08
7-16 to ⅜ and 2¾ to 3 in	.09
3⅛ to 4 in	.09⅜
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in	.10½
¼ to 9-32 and 6¼ to 7 in	.11
1 in	.13

Burden Boiler Rivets.

½, ⅝, 11-16 and ¾ inches diameter	3 co
Bridge ½, ⅝, 11-16 and ¾ inch diam	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, four 10s			.62
Butt " " " four 10s			.62½
Lap " galv. " four 10s			.52½
Butt " " " four 10s			.50
Boiler tubes 2¼" and smaller			.70
Boiler tubes 2½" and larger			.75
Casting screw and socket joint			dis. 52½
Casing inserted joint			dis. 47½

MACHINERY SUPPLY MARKET.

[From Store, Cleveland.]

Anvils.

American	₩ lb 9@10
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis 40
	Bullock's	dis 50&10
Moulders'		dis 40@40&10
Hand		dis 40&10@50

Belting.

Boston Belting Co.'s standard	dis 10 & 10
" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shults Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shults Raw Hide Leather Belting, Double and Light Double	dis 4[illegible]
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@15
Pratt & Whitney	dis 10@15
Standard	dis 10@15
Morse	dis 10 to 15
Brown & Sharpe, Milling Cutters	dis 15
" " Gear Cutters	dis 15

Crowbars.

Cast Steel	₩ 3½
Iron, steel points	₩ lb 3

Drill and Drill Sockets.

Twist Drills	
Morse Taper&Straight Shank to 1⅜"	dis 50 &10 to 60
Morse Taper and Straight Shank Larger than 1⅜"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 46 gr.	54 to Flour, 150 gr.	C. F F. F
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5¼c	3 c
10 lb cans, 10 in case	5 c	6¼c	5 c
10 lb cans less than 10	10 c	10 c	7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 50@50&5
H. H. Barton.....dis 50@50&5

Emery Wheels.

Detroit.....dis 60@70
Norton's.....dis 60@70
Grant.....dis 60@70
Sterling.....dis 60@70
Celluloid.....dis 10&33⅓
Northampton.....dis 50
Crystal.....dis 65@70
Vitrified.....dis 60@70
Vulcanite.....dis 60&10
Hamden.....dis 60&10@70
Cyclone.....dis 60@60&10

Files.

Arcade.....dis 60&10@60&10&10
Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
McClellan.....dis 60&10@60&10&10
Disston's.....dis 60@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50
Industry File Works Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs.....10c
" " " " over 5 lbs.....8c

Jack Screws.

Illinois Bolt Co. list.....dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15½	11½	8⅝	6	5¼	5¼	
Washers	9	8	7	5	4½	4½	4⅛

In lots less than 100 lbs, ⅜ lb add ¼c., 1 lb boxes add 1c to list.

Nails (wire).

Standard Penny Nails, ⅜ keg, base.
{ Car lots.....$1.40
{ Less than car lots...$1.50

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ⅜ doz.....dis 10@10&10

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Rivets.

Iron, Thousand, list November 1, 1894.....dis 60@65
Iron, Ordinary, Cooper's Block and Carriage list November 1, 1894.....dis 60@65
Copper.....dis 50@50&10

Taps.

Cards, Hand and Nut to 2 in.....dis 5
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list.....dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 55
Pulley Taps.....dis 40

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 15@20
Howard.....dis 35

Wire.

New List, Apr. 9, 1894

Brass.....dis 35c
Copper.....dis 35c
Bright and annealed, Nos. 0@18.....dis 70&10@75
" " Nos. 19@26.....dis 75@75& 5
" " Nos. 27@36.....dis 75&10& 5
Coppered Nos. 0 to 18, market list.....dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis65& 5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....95c ⅜ lb dis 30

Persistence In Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

Waverley Bicycles

For five years Waverleys have stood the test of public opinion, with the result that they are voted the best that American genius and mechanical skill can make.

Perfect Bearings

can be found on no other wheel than the new '97 Waverley. A magnificent and expensively made wheel, well worth its price, **$100**

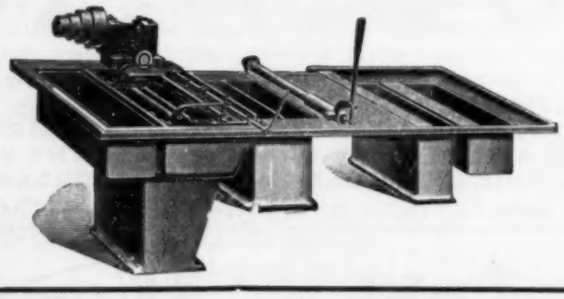
Still another Waverley—the popular model of last year—now **$60** It was not necessary to purchase new and expensive machinery to continue its manufacture.

INDIANA BICYCLE CO.
INDIANAPOLIS, IND.

CATALOGUE FREE.

THE LLOYD-BOOTH CO., YOUNGSTOWN, OHIO.

Tinning MACHINERY.



Rolling Mills, Sand and Chill ROLLS.

..'96 JENKINS '96..

Is the Perfection of Joint Packing. Instantaneous. Does not Squeeze Out and not Necessary to follow up Joint. We guarantee it to last for years on any and all pressures of steam or any kind of joint where packing is required. **Does not Rot. Burn or Blow Out,** therefore the best for all purposes. Call for and insist on having **'96 JENKINS '96** stamped like cut.

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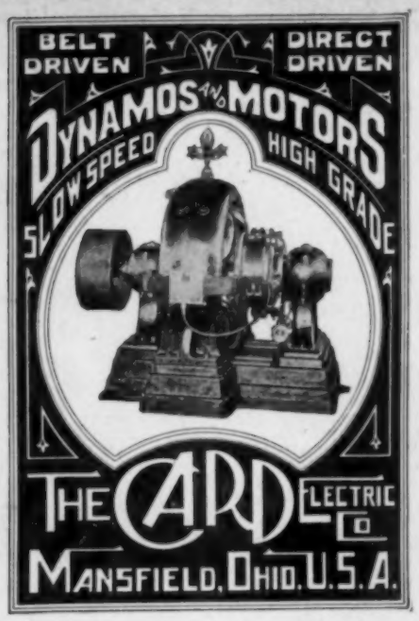

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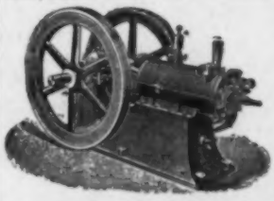

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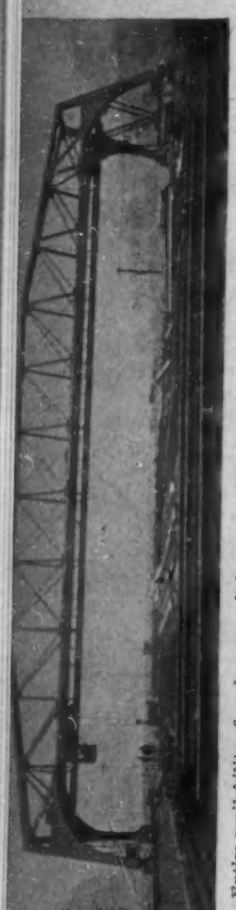

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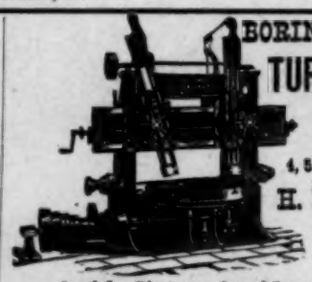

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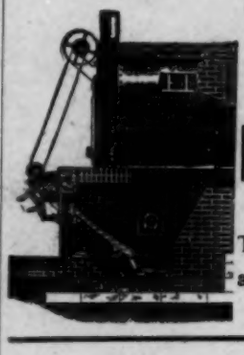

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